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Revision and phylogeny of the Caribbean weevil genus *Apotomoderes* Dejean, 1834 (Coleoptera, Curculionidae, Entiminae)

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Abstract

The weevil genus *Apotomoderes* Dejean, 1834 (Curculionidae: Entiminae: Geonemini) is revised, including a redescription of the only previously known species, *A. lateralis* (Gyllenhal, 1834), and descriptions of five new species: *A. anodontos* **sp. n.,** *A. menocrater* **sp. n.,** *A. sotomayorae* **sp. n.,** *A. chariedris* **sp. n.,** and *A. hadroprion* **sp. n.** The monophyly of *Apotomoderes* is supported by multiple synapomorphic character states including the two-segmented labial palps, a postocular constriction on the head, a sexually dimorphic, globular pronotum in males, and the presence of setae in the dorsal subapical region of the aedeagus. In addition, all species of *Apotomoderes* except *A. anodontos* have a large, knife-like cuticular tooth on the profemur and a toothed ridge along the anteromesal margin of the protibia. Illustrations of external and internal morphological traits are provided, along with a key to the six constituent species. A cladistic analysis of 12 taxa (6 outgroup, 6 ingroup) and 22 characters yielded a single most parsimonious cladogram (L=33, CI=75, RI=90) with the topology (*A. anodontos,* (*A. menocrater,* (*A. sotomayorae,* (*A. lateralis,* (*A. chariedris, A. hadroprion*))))). A species of *Artipus* Sahlberg (Naupactini) was placed as the most immediate relative of *Apotomoderes;* however, the state of phylogenetic knowledge of Caribbean entimine weevil is still too incomplete to warrant any higher level rearrangements. All species of *Apotomoderes* occur on Hispaniola with the exception of *A. sotomayorae* which is endemic to Mona Island, Puerto Rico. A historical biogeographic reconstruction yielded the taxon-area cladogram (southwestern Dominican Republic, (eastern Dominican Republic, Mona Island)), suggesting two successive eastbound colonization events in the Miocene/Pliocene, originating from the southern Hispaniola peninsula. Reliable host plant records are unavailable although adults of *A. menocrater* have been found on allspice (*Pimenta* Lindley; Myrtaceae) and lignum vitae (*Guaiacum* Linnaeus; Zygophyllaceae).

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Keywords
Dominican Republic, Mona Island, Puerto Rico, cladistics, colonization, endemism, historical biogeography, new species, taxonomy, weevils

Introduction

The entimine weevil genus *Apotomoderes* Dejean (1834: 253) was originally proposed to accommodate a single species, *A. lateralis* (Gyllenhal 1834: 45), from Hispaniola. Dejean had transferred this species out of Schoenherr's *Apotomus* (1834: 44), a name which was published just weeks earlier (Alonso-Zarazaga and Lyal 1999) yet which constitutes a junior homonym of *Apotomus* Illiger (1807: 348), a genus of Carabidae. Consequently, *Eurilia* Laporte (1840: 308) is an unnecessary replacement name for *Apotomus* Schoenherr, and also a synonym of *Apotomoderes.* Both Dejean (1834) and Schoenherr (1840) incorrectly attributed the valid genus and species name to Carl Gustav Mannerheim who had described the species in a letter to Schoenherr and then donated the type specimen to Schoenherr's museum. For a relatively short period of time, a second species, *A. albicans* (Lacordaire 1863a: 21) was placed in this genus, until it was transferred to *Megalostylus* Schoenherr (1840: 114) by Chevrolat in 1878 (p. LXVI; as *M. farinosus* [junior synonym]) and then by Pascoe 1881 (p. 42; as *M. expansus* [junior synonym]), as reviewed in Champion (1911: 241–246). Thus in effect, no other species of *Apotomoderes* have been described since 1834 (O'Brien and Wibmer 1982; Pérez-Gelabert 2008).

Schoenherr (1834) provided the most detailed description of *Apotomoderes* to date, emphasizing the postocular constriction of the head, prominent eyes, expanded pronotum, subovate elytra, and conspicuously toothed profemora as diagnostic features. He placed the genus in his division Brachyderides, and particularly in the vicinity of the Old World genus *Cratopus* Schoenherr which is presently assigned to the tribe Cratopodini Hustache (Lyal and Alonso-Zarazaga 2006). Lacordaire (1863b: 25–27, 64–66) classified *Apomotoderes* in the Naupactides (= Naupactini Gistel), but distinguished the genus from all other members of this tribe in light of the posteriorly constricted head. Lacordaire (1863b: 81–82) also mentioned a possible affinity of *Apotomoderes* with *Megalostylus.* Interestingly, his description of "*A. lateralis*" from Haiti ('uniform opal grey, epipleura of elytra chalk white') applies to another species, described below. Subsequently, the genus was placed in the tribe Barynotini Lacordaire (e.g. Blackwelder 1947: 796, O'Brien and Wibmer 1982: 41) whose current valid name is Geonemini Gistel (Alonso-Zarazaga and Lyal 1999). However, none of the past or present tribal placements of *Apotomoderes* are well corroborated given that the mid-level classification of entimine weevils remains poorly understood (Thompson 1992; Marvaldi 1997; Oberprieler et al. 2007).

Field work in the Dominican Republic and on Mona Island, Puerto Rico, has brought to light several new species of *Apotomoderes.* These species are herein described and illustrated, and the genus is revised, including a generic redefinition, redescription

of the type species, key to all species, phylogenetic analysis, and historical biogeographic reconstruction.

Methods

Morphological studies. The descriptive sequence used in this study is in accordance with Franz and Girón (2009). Morphological terms usually follow Torre-Bueno (Nichols 1989); with additional specialized terms used for the mouthparts (Ting 1936; Morimoto and Kojima 2003), apex of rostrum (Vaurie 1963), metendosternite (Velázquez de Castro 1998), wings (Zherikhin and Gratshev 1995), tibial apices and abdominal segments (Thompson 1992), and male and female terminalia (Howden 1995; Velázquez de Castro 1997; Wanat 2007). Specimens were observed with a Leica MZ16 stereomicroscope (magnification: 7–115×) and an Olympus BX41 compound microscope (magnification: 20–400×), each equipped with an ocular graticule for length measurements. The overall body length was measured (in dorsal view) from the anterior margin of the eye to the posterior margin of the elytra; whereas the length of the rostrum was measured from its apex to the anterior margin of the eye. The number of individuals measured is written once in parentheses for all measurements of external structures; another separate number reflects the number of measurements for the length/width relations of the wings and the median lobe. The numbering of the abdominal ventrites reflects their homology within Curculionoidea (Thompson 1992). The original species accounts were trimmed to emphasize diagnostic features and characters with potential phylogenetic relevance. Features that are shared between the male and female are usually mentioned only once (in the male), as are similar traits on serially homologous structures such as the legs.

The habitus photographs were taken with a Microptics XLT imaging system. All drawings of internal structures were prepared with a drawing tube attached to the compound microscope. The initial, simplified line sketches were scanned and redrawn using an illustration software program, thus highlighting features with diagnostic significance.

Type material. The labels for new type specimens include the genus name and species epithet, a gender symbol, and the author and year. They are colored red for the holotypes and yellow for all paratypes. The insect collection codens are based on Arnett et al. (1993), as follows.

CMNC	Canadian Museum of Nature Collection, Ottawa, Canada
CWOB	Charles W. O'Brien Collection, Green Valley, Arizona, USA
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, USA
MEBT	Museum of Entomology and Tropical Biodiversity, Río Piedras, Puerto Rico, USA
MHND	Museo Nacional de Historia Natural, Santo Domingo, Dominican Republic
NMNH	National Museum of Natural History, Washington, D.C., USA

UPRM Invertebrate Collection, University of Puerto Rico at Mayagüez, Puerto Rico, USA

WIBF West Indian Beetle Fauna Project Collection, Bozeman, Montana, USA

Phylogenetic analysis. All species of *Apotomoderes* were identified as such through application of the phylogenetic species concept (Wheeler and Platnick 2000), and were included as ingroup taxa in the phylogenetic analysis. Suitable outgroup taxa include representative species from the tribes Eustylini: *Exophthalmus quadrivittatus* (Olivier, 1807) and *Scelianoma elydimorpha* Franz & Girón 2009; Geonemini: *Lachnopus kofresi* Wolcott 1941 and *Lachnopus valgus* (Fabricius, 1775); and Naupactini: *Artipus floridanus* Horn 1876 and *Pantomorus elegans* (Horn, 1876; named *Phacepholis elegans* in Lanteri 1990; though see Scataglini et al. 2005 for a later perspective). The selection was informed in part by preliminary results from phylogenetic studies of Caribbean entimine weevils (NMF, unpublished), and the cladogram was rooted accordingly with *E. quadrivittatus*. Autapomorphies for species of *Apotomoderes* are presented in the species accounts yet were excluded from the cladistic analysis. Reductive coding (Strong and Lipscomb 1999) was use in select instances to represent homology assessments pertaining to particular species groups.

The character matrix was compiled, edited and refined using the matrix and tree interfaces in WinClada (Nixon 2002). The characters were numbered based on their sequence of appearance in the taxonomic descriptions. The most parsimonious cladogram and character state optimizations were identified using NONA (Goloboff 1999). An exhaustive search of the tree space for the 12-taxon matrix was performed using the commands "whennig" and "mswap+". Finally, branch support values (Bremer 1994) were calculated in NONA with "hold 10000", "suboptimal 20" and "bsupport 20".

Historical biogeography. A historical vicariance analysis of *Apotomoderes* was performed through integration of the species phylogeny with the inferred areas of endemism (Morrone 2009). In light of an obvious alignment of the phylogeny and geographic areas, only assumption 0 *sensu* Nelson and Platnick (1981; component analysis) was employed to generate a taxon-area cladogram (see also Page 1990). The resulting scenario was reconciled with available geological information (Iturralde-Vinent 2006).

Apotomoderes Dejean (1834: 253)

= *Apotomus* Schoenherr (1834: 44) [non Illiger 1807; junior synonym]
= *Apotomoderes* Schoenherr (1840: 402) [non Dejean 1834; unnecessary replacement name]
= *Eurilia* Laporte (1840: 308) [unnecessary replacement name]

Type species: *Apotomoderes lateralis* (Gyllenhal, 1834: 45), by monotypy (originally as *Apotomus lateralis*).

Diagnosis. *Apotomoderes* keys to *Artipus* Sahlberg in Anderson (2002), by virtue of the absence of a postocular lobe and vibrissae, the laterally positioned scrobe, the long median sulcus on the rostrum, laterally positioned eyes, and the conspicuous epistoma. However, *Apotomoderes* can be distinguished from this and other genera of Caribbean entimine weevils (cf. O'Brien and Wibmer 1982) by a unique combination of synapomorphic and/or diagnostic features; viz. scale coverage complete; labial palps 2-segmented (Fig. 3B); rostrum dorsally with a transverse depression (e.g. Fig. 13B); antennal scape only moderately stout; head with a postocular constriction (e.g. Fig. 9B); eyes protruded, globular; pronotum sexually dimorphic, larger and more globular in males (e.g. Fig. 11A); metatibial apex simple, without a bevel or flange ("corbel open"), margins lined with spiniform setae, surface surrounding condyle partially covered with scales; presence of setae in the dorsal subapical region of the aedeagus (e.g. Fig. 5D); aedeagus with a pair of weakly sclerotized rami along ostium; and spermatheca with collum and ramus subcontiguous (e.g. Fig. 17C). In addition, nearly all species of *Apotomoderes* have a large, knife-like cuticular tooth only on the profemur and a conspicuously toothed ridge along the anteromesal margin of the protibia (in idealized orientation of legs) in both males and females (e.g. Fig. 13C). The genera and species most closely related to *Apotomoderes* are likely still undescribed (NMF, personal observation), but differ from this taxon minimally by the shape of the head and pronotum.

Redescription – male. Length 4.32–10.70 mm, width 1.65–4.95 mm; shape elongate to oval, length/width ratio 2.16–2.80; widest at humeri (to anterior third). Integument dark reddish brown. Linear, piliform scales ("setae") sparse throughout, short, recurved, transparent white to yellow. Scales densely and homogeneously arranged throughout, partially overlapping and covering most of integument, mostly subcircular to subquadrate to irregular (pronotum), colors variously interspersed creamy white to beige/tan to (light rusty to dark) brown, or locally "transparent", scales arranged in complex regional to irregular patters, often locally (rostrum, pronotum, legs, elytral punctures) also with yellowish, greenish, pinkish, turquoise or (pale) blue iridescent metallic scales creating secondary underlying patterns.

Mouthparts. Mandibles with 4–6 longer setae, and several shorter setae and piliform scales adjacent to projected, apicolaterally positioned scar. Maxillae (Fig. 3A) with cardo elongate, basically widely bifurcate, with sparse setae; stipes elongate, not mesally projected, with lateral setae; galeo-lacinial complex not extending to apex of maxillary palpomere I, apically rounded, covered with setae throughout, with 6–8 apicomesal "lacinial teeth" (Ting 1936), thereafter (along mesal margin) with a tuft of very long setae; palpiger with transverse row of setae; maxillary palps 3-segmented; I longer than II, with 2 apical setae; II slightly shorter than III, with 2 apical setae; III elongate, with parallel sulci, apically papillate. Labium (Fig. 3B) with prementum entirely covering maxillary palps; escudate or pentagonal, ventrally evenly concave; apical margin medially projected (ligula), angulate; each lateral region with 3–5 long setae; labial palps 2-segmented, II reaching apical margin of prementum; I shorter than II, with 1 apical seta; II elongate, apically papillate.

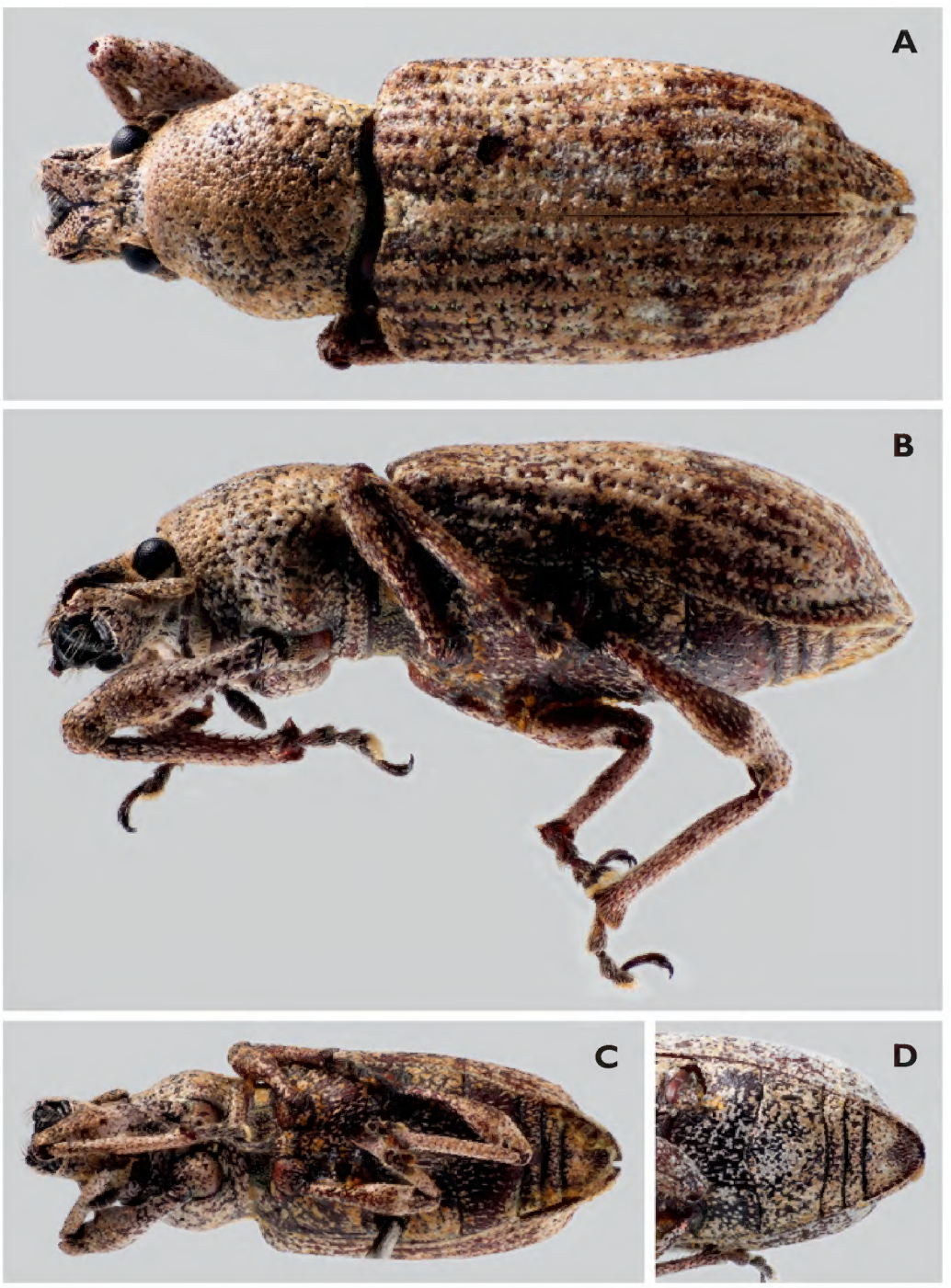

Figure 1. Habitus of A. lateralis: **A** male, dorsal view **B** male, lateral view **C** male, ventral view **D** female, venter, ventral view.

Rostrum. Length 0.45–1.28 mm, rostrum/pronotum length ratio 0.28–0.42, rostrum length/width ratio 0.60–0.82; shape in cross-section subrectangular. Dorsal outline of rostrum subrectangular; dorsolateral margins anteriorly slightly diverging; apical margin emarginate-triangular, profoundly incised. Nasal plate (Vaurie 1963) well defined, inversely V-shaped, concave, posteriorly carinate; epistoma forming a narrow line basad of carina, without scales yet with a row of long, mesally directed setae; region basad of epistoma distinctly depressed, covered with variously colored, iridescent metallic scales. Dorsal surface of rostrum with a subcircular to transverse concavity near midpoint, and with 1 median sulcus extending from posterior margin of epistoma to imaginary midpoint between (or slightly beyond) dorsal margins of eyes, ending in a narrow fovea; each dorsolateral margin with (or without) a poorly defined, short and irregular sulcus anteriad of eye; ventrolateral margins subparallel. Rostrum in lateral view nearly straight, apically slightly expanded; ventrolateral sulci well defined, extending parallel

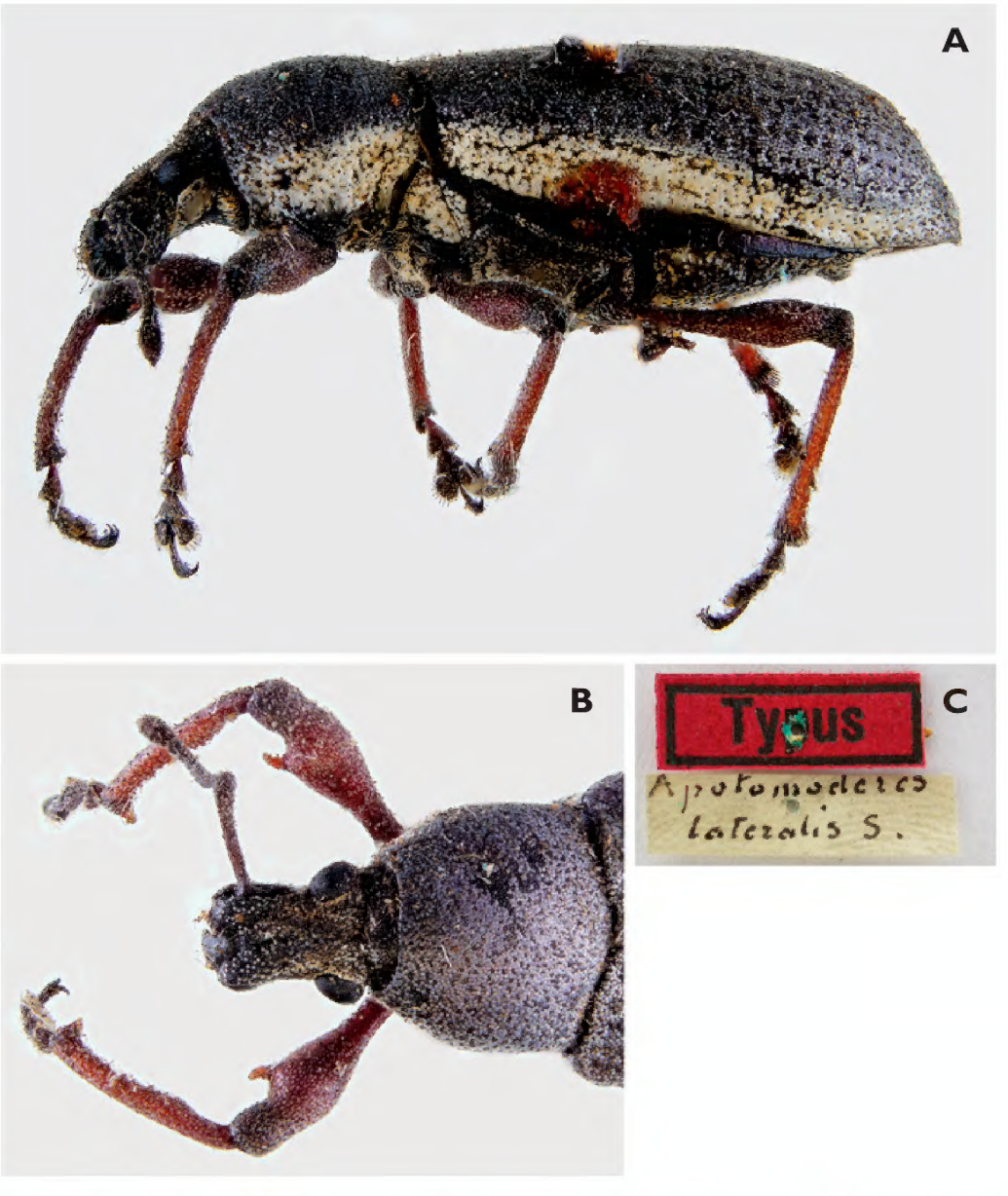

Figure 2. Habitus of female type specimen of *A. lateralis,* located in the Naturhistoriska Riksmuseet, Stockholm, Sweden: **A** lateral view **B** head, thorax and prolegs, dorsal view **C** specimen label. Photographs taken by Johannes Bergsten.

to and ventrad of scrobe; margins of mandibular incision with evenly spaced, linear scales. Rostrum ventrally with 2 paramedian sulci. Antennal insertion near anterior 2/5 of rostrum. Scrobe lateral, strongly curved and posteriorly widened (subtriangular), initiating at apicodorsal apex, region, terminating in ventrolateral region, anteriad of eye, dorsal margin angulate, ventral margin (typically) curved, covered with scales.

Antennae 11-segmented. Scape moderately stout, nearly straight, clavate; extending to region between posterior margin of eye and anterolateral margin of pronotum, directed ventrad of eye in idealized position; covered with linear scales. Funicle 7-segmented, slightly longer than scape; funicular antennomeres progressing from elongate to equilateral, clavate, covered with appressed and suberect, linear scales; I and II (usually) similar in length. Club 3-segmented, similar in length to funicular antennomeres III–VI, nearly 3× longer than wide, dark brown, pubescent; I and II similar in length; III slightly longer, conical, transversely sutured.

Head. Eyes laterally positioned, variously globular, strongly protruded, in some species posteriorly abruptly curved and "tilted" posteriad, anterodorsal margin of each

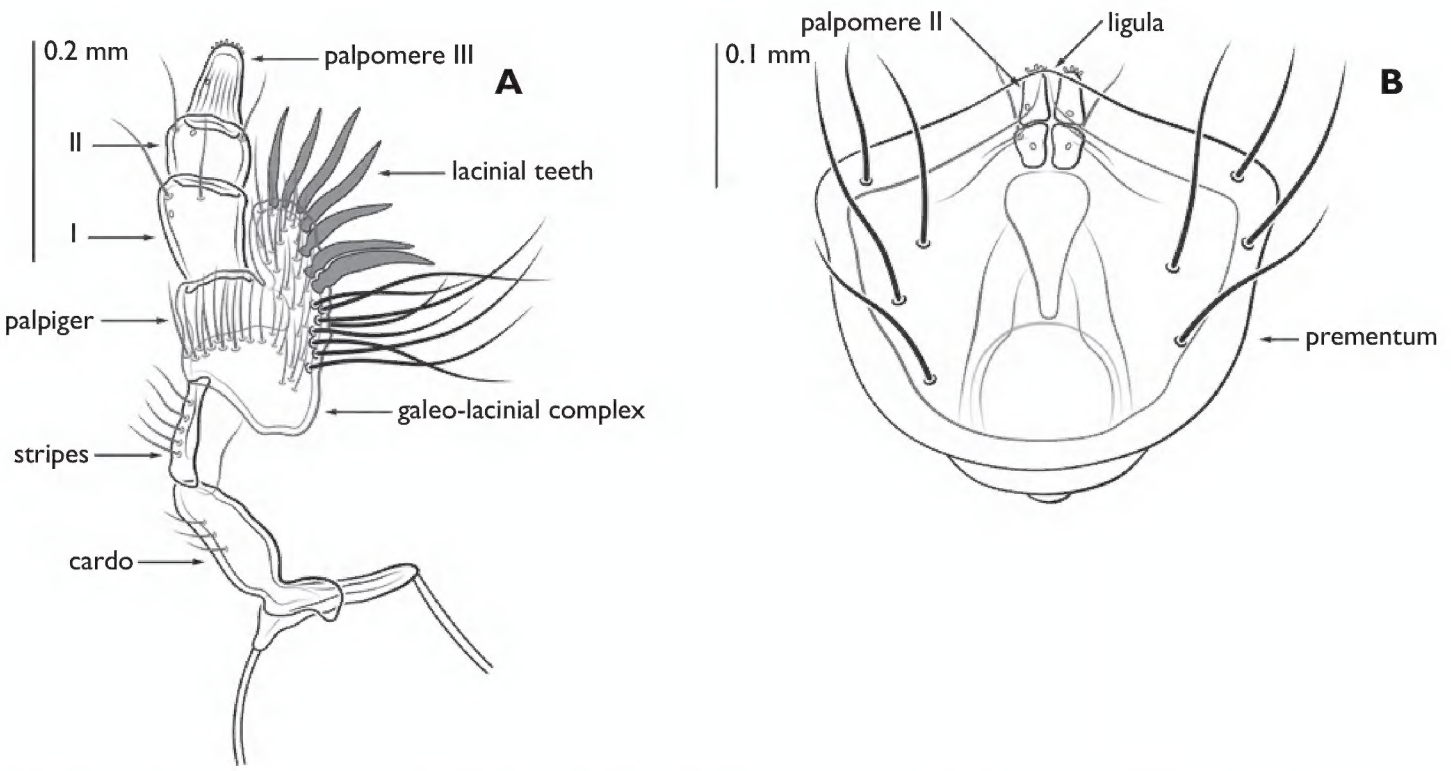

Figure 3. Mouthparts of *A. lateralis*: **A** right maxilla, ventral view **B** labial prementum, ventral view.

eye impressed, posterior margin nearly straight, elevated (set off) in relation to head; eyes (usually) separated (in dorsal view) by distance nearly 2× as long as anterior-to-posterior length of each eye. Head with apparent postocular constriction extending along entire circumference, rostrum and head in lateral view angulate.

Thorax. Pronotum variously equilateral, length/width relation 0.80–1.20, pronotum/elytra ratio 0.42–0.55, slightly to strongly globular (convex); widest near midpoint, anteriorly constricted; surface punctate, with equilateral to irregularly shaped, variously colored scales; median sulcus absent. Anterior margin of pronotum slightly curved, lateral margins strongly curved, posterior margin bisinuate, posterior side with plumose scales. Pronotum in lateral view globular, anteriorly constricted; anterior margin nearly straight, postocular lobe and vibrissae absent.

Scutellum exposed, semi-circular, slightly wider than long, anterior margin straight, posterior margin rounded, covered with creamy white scales.

Epipleura with mesepisternum triangular; mesepimeron dorsally obliquely narrowed; metepisternum linear, anteriorly abruptly widened; metepimeron entirely covered by elytron.

Prosternum (Figs. 1C, 14B) longer than mesosternum, with a transverse sulcus on each side anteriorly and posteriorly of procoxal cavities; procoxal cavities positioned at midpoint, contiguous, prosternal process short, elevated. Mesosternum slightly shorter than metasternum, strongly angulate, mesocoxal process slightly elevated; anterior half coved with plumose scales, posterior half with longer, suberect, linear scales; mesocoxal cavities separated by distance nearly half as long as width of each mesocoxal cavity. Metasternum with median sulcus present as a large, transverse fovea positioned anteriad of posterior margin, surface slightly undulate, posterolateral regions set off (with small posterior "face"), and with linear scales (see above); metacoxal cavities separated by distance slightly shorter than width of each mesocoxal cavity.

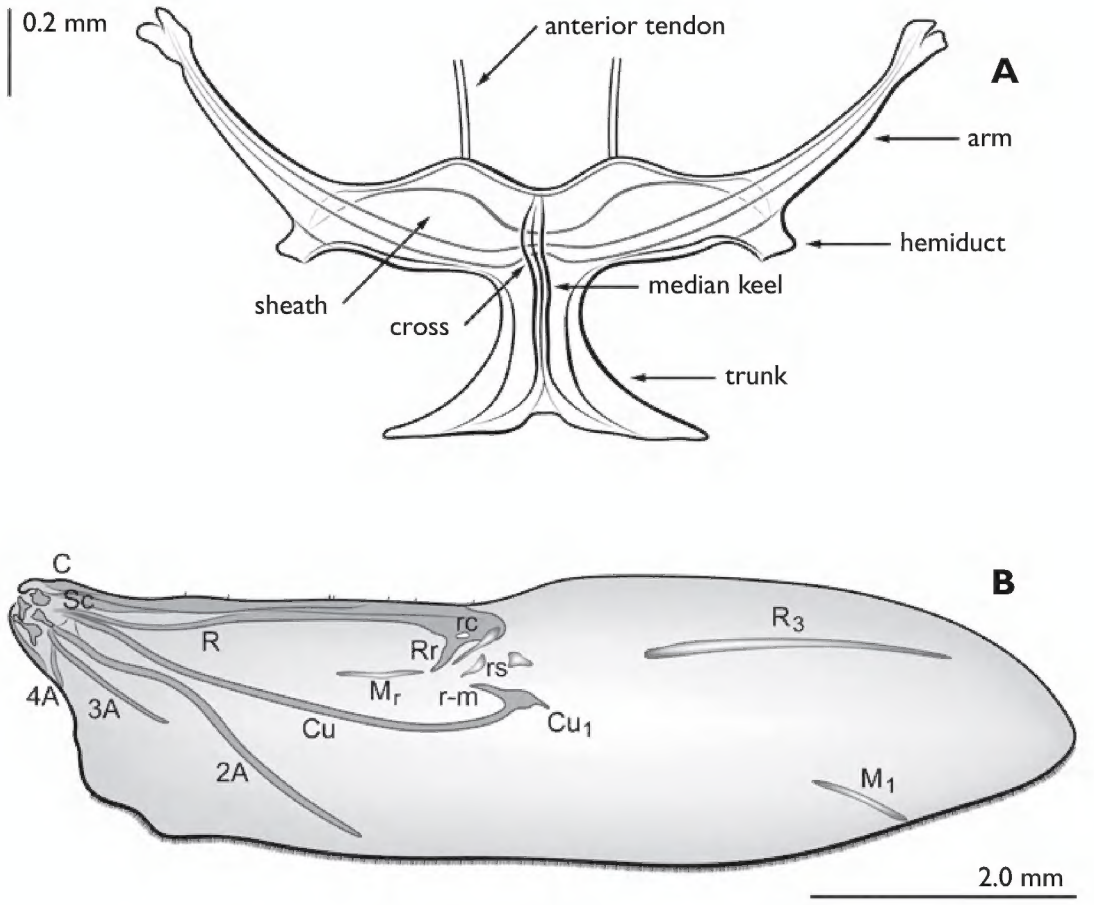

Figure 4. Metendosternite and hind wing of *A. lateralis*: **A** metendosternite, posterior view **B** right hind wing.

Metendosternite (Fig. 4A) with stalk slightly shorter than furcal arms, ventral margin 2–3× wider than dorsal width of stalk; hemiducts wide, truncate; dorsal margin of sheath undulate; anterior tendons positioned near midpoint between median keel and base of furcal arms; furcal arms diverging at 30–45° in relation to medial keel.

Legs. Prothoracic legs longer than mesothoracic legs; scale colors variously interspersed, though forming a more uniform light/dark/light pattern on femora, metallic scales often present on anterior sides of profemora and near tibial apices; ventral sides of tibiae with rows of longer, whitish or yellowish, suberect setae. Profemur/pronotum length ratio 0.80–1.08; profemur moderately stout, in cross-section subcircular; (usually) with 1 very large, knife-like cuticular tooth inserted at apical 2/5 on anteromesal margin, tooth ventrally directed (absent in one examined species). Protibia/profemur length ratio 0.84–1.02; protibia moderately stout, nearly straight, in cross-section elliptical, apically slightly expanded; anteromesal margin with a distinct, laminate, rounded or triangular projection near basal 2/5 (absent in one examined species), from thereon to apex with row of 10–15 smaller, apically rounded or (oblique) truncate cuticular teeth (teeth larger along laminate projection), each tooth distally with an aurate, spiniform seta; protibial apex with anterior margin truncate, setal comb absent; mucro similar in length to tarsal claw, surpassed by tufts of aurate setae. Protarsus with tarsomere I nearly 2× as long as II, elongate, clavate; II and III similar in length, equilateral to transverse; and jointly similar in length to V; claw paired, separate, simple. Meso- and metathoracic legs slighter shorter and longer than prothoracic legs, respectively; meso- and metafemora unarmed; meso- and metatibiae lacking laminate projec-

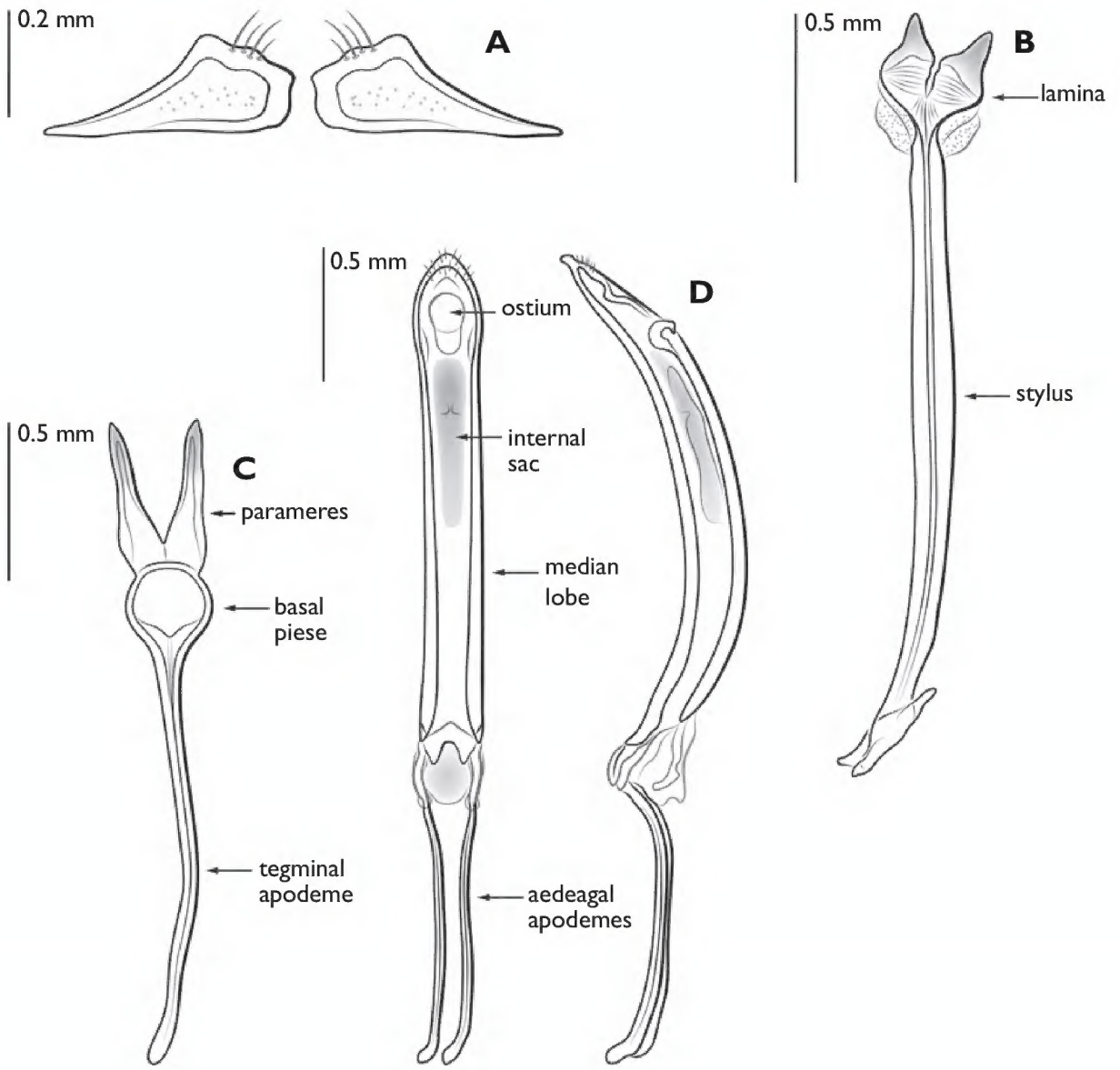

Figure 5. Terminalia of *A. lateralis,* male: **A** sternum VIII **B** spiculum gastrale **C** tegmen **D** aeadeagus, ventral and lateral view.

tions, teeth along anteromesal margin less pronounced; metatibial apex simple, with anterior margin curved (on side opposed to mucro), projected, margins with a comb of spiniform setae of increasing length, yet without a bevel or flange ("corbel open"), surface surrounding metatarsal condyle glabrous to partially covered with (metallic) scales "invading" surface from dorsal side.

Elytra. Length/width ratio 1.52–1.90; widest at humeri (to anterior third); anterior margins jointly wider than posterior margin of pronotum, sinuate; humeri obliquely rounded; lateral margins posteriorly slightly converging in anterior half, thereafter more strongly converging, rounded, posteriorly attenuate; posterior margins narrowly truncate. Elytra in lateral view slightly convex; posterior declivity apparent though not strongly angulate, nearly straight. Elytra with 9 complete striae and 1 incomplete stria; striae similar in width to intervals; stria X indistinct ("merging with stria IX") in second third of entire length; punctures separated by distance similar to, or slightly longer than, width of each puncture; intervals slightly elevated; scales covering entire integument, arranged in mostly irregular micro-patterns of creamy white to dark brown hues, though often locally also with iridescent metallic scales, including (in most species) a single colored or metallic scale in each strial puncture.

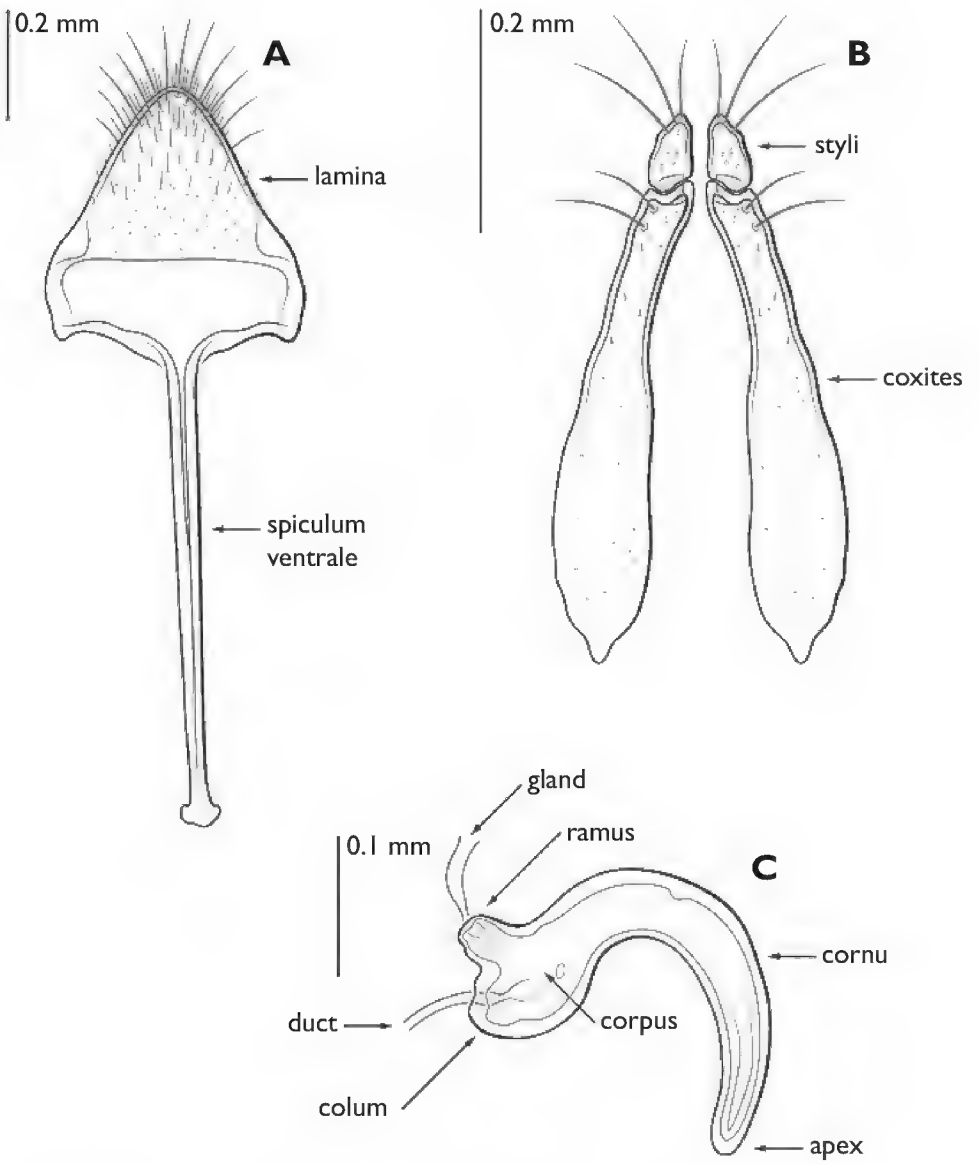

Figure 6. Terminalia of *A. lateralis,* female: **A** sternum VIII **B** coxites and styli **C** spermatheca.

Wings. Wings (Fig. 4B) fully developed (absent in one examined species), elongate (linear), wing/body length ratio 1.15–1.35, wing length/width ratio 3.30–3.78; anterior margin slightly angulate near midpoint; posterior margin nearly straight, undulate in anal area; anal lobe absent. Alar veins well defined: C, Sc, R, Rr and rs distinct, radial cell present; M_r and Cu_1 short, r-m reduced; 2A distinct, 3A and 4A weaker; R_3 distinct, M_1 reduced, only apparent distally.

Abdomen. Venter (Figs. 1C, 1D, 14B) with segments III and IV narrowly connected (jointed), slightly elevated, V-VII separate; appressed, subcircular scales less abundant in mesal region of venter, "replaced" with longer, suberect linear scales, particularly on III and posterior half of VII; III longer than IV, mesally plane, posterior margin slightly emarginate; IV longer than V and VI together; V and VI similar in the length, anterior and posterior margins nearly straight; VII similar in length to IV, (widely) subtrapezoidal, with 2 subcircular, slightly impressed anterolateral regions with abundant scales, lateral margins gradually rounded, posterior margin very slightly emarginate. Tergum VII on each side with a subcircular, transversely strigulate region. Pygidium (tergum VIII) entirely covered by elytra, convex, lateral margins posteriorly roundly converging, posterior margin plicate, medially roundly emarginate.

Terminalia. Sternum VIII (Fig. 5A) consisting of 2 transversely oriented, subtriangular sclerites (connected via membrane); each sclerite laterally acuminate, posterior margin strongly angulate, with 4–6 setae; spiculum relictum minute. Spiculum gastrale (Fig. 5B) slightly longer than median lobe; anteriorly expanded into an alate, irregular lamina; stylus slightly sinuate; posteriorly bifurcate, furcal arms weakly sclerotized, wide and explanate, arms apically slightly diverging, gradually narrowed, apices more sclerotized, slightly curved outwards, lacking setae. Tegmen (Fig. 5C) slightly shorter to slightly longer than median lobe; tegminal apodeme slender, sinuate; basal piece apically with 2 narrowly triangular projections (parameres), each arm apically increasingly finely denticulate. Aedeagus (e.g. Fig. 5D) with median lobe (aedeagal pedon) length/width ratio 6.12–9.50; basiventral margin strongly emarginate, with 2 lobe-like (to triangular), sclerotized projections; lateral margins mostly subparallel throughout, outline minimally expanded in region of ostium, thereafter gradually converging, rounded or straight, apex variously rounded to narrowly projected. Median lobe in lateral view homogeneously curved; width similar throughout basal three fourths of entire length, in apical fourth dorsal margins converging towards apex in a straight line; dorsal subapical region with a small region of short, recurved setae; apex narrowed or with a terminal, knob- or lobe-like projection. Internal sac with variously plicate membranes though lacking sclerites or denticles, in most species with 2 weakly sclerotized, angulate-uncinate rami (apices directed laterally or mesally); ostium large, elliptical, basal and apical edge of ostium each with a recurved invagination. Aedeagal apodemes nearly half as long as median lobe, proximally embedded in a membranous evagination of median lobe, not sclerotized; distally sclerotized, slender.

Female. Overall very similar to male. Length 4.76–11.88, width 1.95–4.60 mm, length/width ratio 2.40–2.92, widest at humeri to midpoint. Rostrum length 0.46–1.32 mm, rostrum/pronotum length ratio 0.30–0.46, rostrum length/width ratio 0.60–0.82. Eyes slightly less protruded and/or posteriorly "tilted". Pronotum length/width ratio 0.92–1.04, pronotum/elytra length ratio 0.36–0.48, typically slightly smaller, less globular, and anteriorly less constricted than in male. Metasternum mesally subplane. Profemur/pronotum length ratio 0.80–1.10, profemur slightly less stout, tooth slightly smaller, protibia/profemur length ratio 0.95–1.03. Elytra length/width ratio 1.66–2.08, widest at humeri to midpoint, lateral margins subparallel in anterior half, posteriorly less attenuate, declivity in lateral view more distinct, very slightly concave. Venter with segment VII slightly shorter than IV, subtriangular, lateral margins posteriorly more strongly converging, posterior margin narrowly rounded. Pygidium larger and more triangular than in male, lateral margins posteriorly more strongly converging, posterior margin not plicate, medially with triangular emargination.

Terminalia. Sternum VIII (e.g. Fig. 6A) with anterior two thirds (spiculum ventrale) narrowly stylate, anterior end knob-like; posterior third (lamina) variously triangular, entire (arms jointed); anterior edges rounded or (slightly) projected, lateral margins nearly straight, continuously converging, posterior margin rounded to truncate; lamina separated in to anterior region (2/5 of entire length) without setae, thereafter laterally with 2 semi-circular, transparent (less sclerotized) regions, and posterior

region (3/5 of entire length) with pores, increasingly dense short setae, and several longer setae along posterior margin. Coxites (Fig. 6B) similar in length to sternum VIII, elongate, slender, posteriorly slightly narrowed, with 2–3 longer setae; styli relatively small, digitate, apically obliquely truncate, with 2–3 long setae. Genital chamber slightly shorter than sternum VIII. Spermatheca (e.g. Fig. 6C) variously C-, U-, V-, or ?-shaped; collum short to reduced, apex of spermathecal duct truncate; collum subcontiguous with, and variously angled (45–150°) in relation to, (very) short to moderately long ramus; corpus very short, though widest overall ("swollen"); cornu much longer, variously curved to angled, apically gradually narrowed, apex with or without additional deflection.

Variation. Variation in size, shape (relative expansion) of the pronotum, "armature" of the profemur and protibia, and particularly in scale patterns is considerable within and among species of *Apotomoderes*. In spite of the remarkable palette of scale colors – ranging from creamy white to dark brown and including several hues of iridescent scales that can occur on many parts of the rostrum, pronotum, elytra and legs – these patterns are often too variable to clearly separate species. In older, worn specimens, large portions or nearly all of the scales are lost, or have turned transparent, exposing the underlying, dark reddish brown integument. Some minor intraspecific variation is apparent in the shape of the male aedeagus and female spermatheca.

Natural history. *Apotomoderes* is restricted to Hispaniola – with two apparently disjunct regions of occurrence in the southwestern and eastern parts of the island – and to Mona Island, Puerto Rico (Fig. 18). The sampled species tend to inhabit lower elevation coastal dry forests. No specific host plant associations are known. It is likely that the species have fairly broad host ranges within their particular habitats, as observed generally in many entimine lineages (e.g. Woodruff 1985; Oberprieler et al. 2007; Franz and Girón 2009).

Etymology. The name *Apotomoderes* is derived from the name *Apotomus* (see above), based on the Greek term *apo-tomós* = abruptly, curtly; and the Greek term *deire* = neck, throat. Thus the name likely refers to the postocular head constriction. The gender is masculine.

Apotomoderes anodontos Franz, sp. n.

urn:lsid:zoobank.org:act:A4DF9315-045D-4684-9A7D-0C04BA623BD7

Figs. 7, 8

Diagnosis. *Apotomoderes anodontos* is the smallest of the herein treated species and is readily differentiated from other species by the absence of a large, knife-like tooth of the profemur and the lack of a ridge-like, toothed projection along the anteromesal margin of the protibia (Fig. 7C).

Description - male. Length 4.32–6.28 mm, width 1.65–2.58 mm, length/width ratio 2.40–2.62 (N=5), widest at humeri to anterior third of elytra or near midpoint of pronotum. Linear piliform scales moderately long and abundant, particularly on

Figure 7. Habitus of *A. anodontos,* male: **A** dorsal view **B** lateral view **C** frontal view, showing unarmed profemora.

legs, elytra, and thoracic and ventral sterna, either transparent white or light (rusty) brown, recumbent to suberect, more appressed on pronotum. With characteristic though locally variable patterns of creamy white and (light) (rusty) brown or tan scales, lighter scales typically more abundant on lateral sides and on legs, creating a two-colored impression, some specimens with semi-regular micro-patterns on elytra, (very) pale blue, moderately iridescent, metallic scales primarily on rostrum and tibiae. Rostrum (Figs. 7B, 7C) short and wide, length 0.45–0.68 mm, rostrum/pronotum length ratio 0.28–0.30, rostrum length/width ratio 0.60–0.66, depressed region basad of epistoma covered with creamy white (slightly iridescent) to (very) pale blue or light greenish metallic scales, thereafter increasingly with tan scales, lateral sulcus anteriad of eye reduced. Rostrum in lateral view nearly 2× wider (dorsoventrally) than long. Ventral margin of scrobe strongly angulate. Scape extending to anterolateral margin of pronotum, laterally compressed, covered with linear and subcircular scales. Funicular segment I longer than II. Head with eyes relatively large, moderately and almost evenly globular (posteriorly not abruptly curved), anterior, ventral, and posterior margins nearly straight, eyes separated (in dorsal view) by distance (much) less than 2× anterior-to-posterior length of each eye, scales on head predominantly creamy white and tan. Pronotum length/width ratio 0.88–0.98, pronotum/elytra length ratio 0.53–0.55, laterally strongly expanded (wide) though not strongly globular (more plane than in other species), scales dorsally predominantly darker, rusty or tan, irregularly shaped, though often with a subquadrate patch of lighter scales mesally near posterior margin, laterally with creamy white scales, creating a two-colored

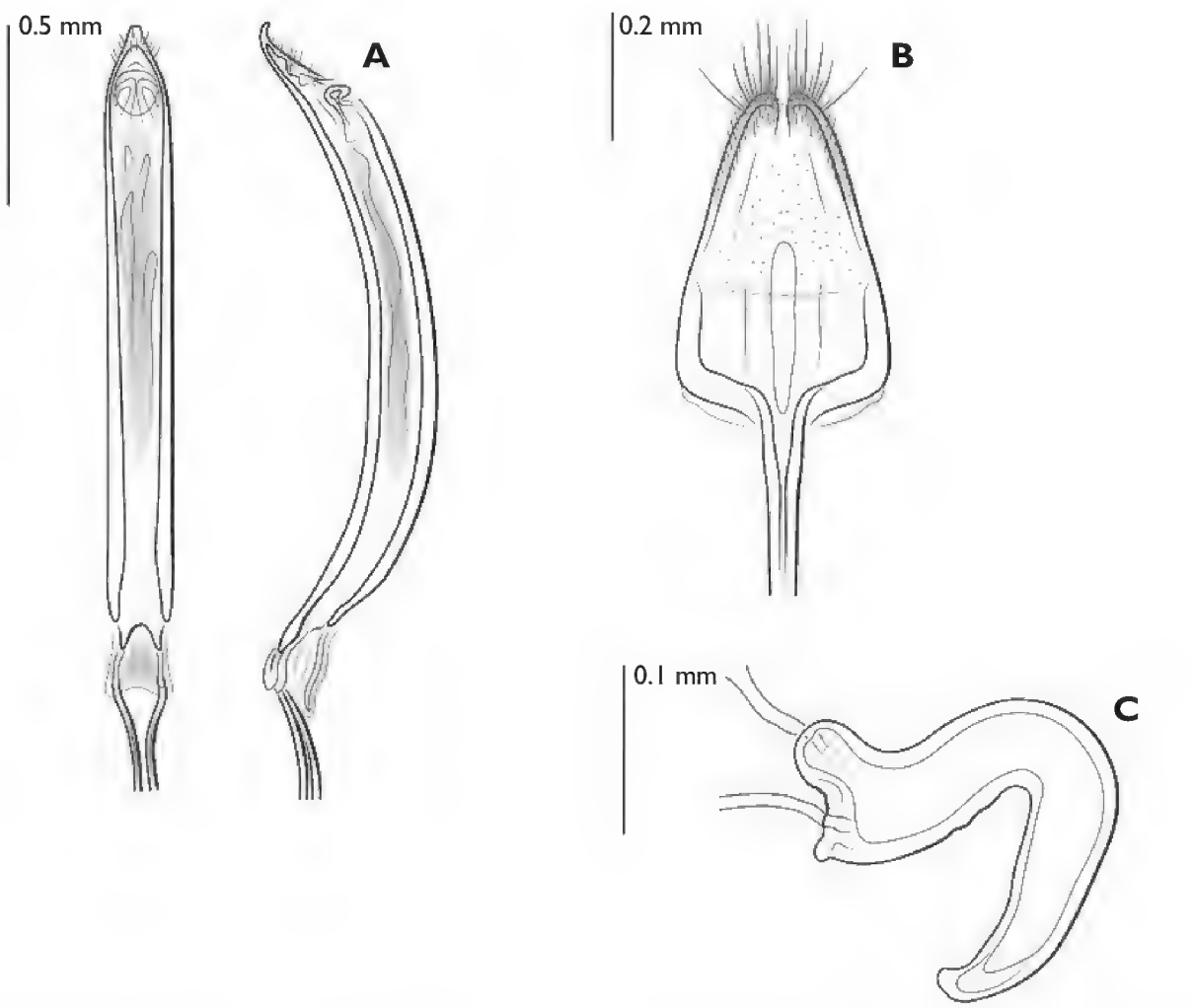

Figure 8. Terminalia of *A. anodontos*: **A** aedeagus, ventral and lateral view **B** sternum VIII, female **C** spermatheca.

impression. Metendosternite similar to *A. lateralis* though furcal arms shorter. Legs predominantly covered with creamy white, rusty, and tan scales (more rarely with pale blue metallic scales, profemur/pronotum length ratio 0.80–0.83, profemur unarmed (lacking anteromesal tooth), protibia/profemur length ratio 0.84–1.02, lacking laminate, rounded anteromesal projection, though with 6–10 alternating smaller and larger, triangular (apically subacute) teeth, less much less prominent on meso- and metatibiae. Elytra (Fig. 7A) length/width ratio 1.60–1.68, scales dorsally (~ striae I–VI) predominantly darker, rusty brown or tan, sometimes with irregular patches of lighter scales, laterally (~ striae VII-X) with creamy white scales more abundant, creating the impression of a lighter stripe, punctures also with a small, creamy white scale. Wings absent.

Terminalia with tegmen slightly longer than median lobe. Aedeagus (Fig. 8A) narrowly elongate, with median lobe length/width relation 8.62–9.50 (N=3), basiventral margin strongly emarginate, lobe-like projections subtriangular, lateral margins subparallel along basal 5/6 of entire length, thereafter nearly straight and triangularly converging towards narrowly rounded, though not point-like, apex. Median lobe in lateral view with width similar throughout basal 5/6 of entire length, apex narrowly projected, slightly reclined, minimally expanded. Internal sac with ostium relatively small, with 2 weakly sclerotized, strongly arcuate-uncinate rami, positioned in ostium and curved outward, apices directed basally.

Female. Length 4.76–5.88 mm, width 1.95–2.38 mm, length/width ratio 2.45–2.50 (N=3), widest near midpoint of elytra. Linear piliform scales on pronotum and elytra more conspicuous and suberect. Rostrum length 0.46–0.60 mm, rostrum/pronotum length ratio 0.30–0.36, rostrum length/width ratio 0.75–0.80, rostrum slightly more narrow than in males. after increasingly with creamy white and variously brownish scales. Pronotum length/width ratio 0.95–0.97, pronotum/elytra length ratio 0.40–0.48, pronotum laterally smaller than in males, laterally not particularly expanded. Legs similar to males, profemur/pronotum length ratio 0.80–0.94, protibia/profemur length ratio 0.96–1.00. Elytra length/width ratio 1.66–1.74, widest near midpoint, very slightly diverging in anterior half, thereafter gradually and roundly converging, declivity apparent in dorsal view as a slight, angulate constriction, mesal interval and stria I at point just posteriad of anterior end of declivity with a small, subcircular, convex elevation with suberect, linear scales, transparent white scales (similar to *A. menocrater;* see Fig. 9D). Venter with segment VII only 3/5 as long as IV.

Terminalia with sternum VIII (Fig. 8B) with posterior 2/5 (lamina) narrowly triangular, in anterior half with a mesal, narrowly elongate, weakly sclerotized area, anterior edges rounded, not projected, posterior margin (narrowly) truncate, with a clear rectangular mesal incision. Coxites with styli basally strongly oblique. Spermatheca (Fig. 8C) V-shaped, ramus and collum angled at nearly 45°, subcontiguous, collum very short, ramus moderately long, apically slightly and roundly expanded, corpus reduced, not strongly expanded, cornu long, strongly angled/curved at basal 2/5, thereafter nearly straight and slightly narrowed towards end which more declined and oriented at nearly 150° in relation to proximal end of spermatheca.

Variation. Larger males have a more strongly expanded pronotum. Some specimens are primarily covered with red or rusty brown scales, other specimens have larger region with an underlying pale blue or greenish metallic hue.

Material examined. Male holotype "D. R. Pedernales, Sierra de Bahoruco, along Rd. Cabo Rojo to Aceitillar, 12.0 km uphill from Rd. 44, transition forest, 395 m, N 18°4'32.0" W 71°39'14.6"/ Jun 09/2008 (RD 9–2), Leg. N. Franz, J. Girón, A. Mazo, S. Navarro" (UPRM). Paratypes, same label information as male holotype (UPRM: 2 males, 3 females); "DOMINICAN REPUBLIC, Pedernales, 4km W Oviedo, 10m, arid[ ]thorn for[est], 91–344, 28.XI.-4.XII.1991, FIT, L. Masner & S. Peck" (CMNC: 2 males, 1 female); "DOMINICAN REPUBLIC, Pedernales, 26km N Cabo Rojo, 565m, 91–347, 29.XI.-3.XII.1991, FIT, evergreen dry forest, L. Masner & S. Peck" (CMNC: 1 male); "D. R. Pedernales, Sierra de Bahoruco, km 10.5 Rd. Cabo Rojo to Aceitillar, night collecting (incl. Hg & UV lights), 100 m, N 18°0'36.1" W 71°38'48.1"/ Jun 09/2008 (RD 9–5), Leg. N. Franz, J. Girón, A. Mazo, S. Navarro" (CWOB: 1 male, 1 female; MHND: 1 male); "REPUBLICA DOMINICANA, Pedernales, Oviedo, dry forest, 5–8-VI-2001, H. Takizawa" (MNHD: 1 male); "DOMINICAN REPUBLIC, 15 km N Cabo Rojo, 10.VII.2004, N18.06.76 W71.37.24. 670 m, leg. A. Konstantinov" (NMNH: 1 male).

Etymology. Named for the unarmed profemora, with *an-* signifying "not" and *odontos* signifying "tooth" (Brown 1956). The epithet is treated as a noun in apposition.

Natural history. *Apotomoderes anodontos* is known to occur in the low to mid elevation dry forests (100–670 m) of the southwestern Pedernales province of the Dominican Republic: Sierra de Bahoruco, Cabo Rojo, and Oviedo (Fig. 18). The host plant associations remain unknown.

***Apotomoderes menocrater* Franz, sp. n.**
urn:lsid:zoobank.org:act:D196352B-4B83-4A30-9633-6A2BF03A25D6
Figs. 9, 10

Diagnosis. *Apotomoderes menocrater* is most readily separated from other congeneric species by the larger, subfoveate punctures in the posterior half of the pronotum (Fig. 9A, 9C). Other diagnostic features include a more elongate shape and more tubular pronotum (particularly in males), the presence of grey metallic scales (though see comments on variation), only moderately protruded and more evenly convex eyes (Fig. 9B), the presence of a patch of suberect scales near the mesal anterior end of the declivity in females (Fig. 9D; shared with *A. anodontos*), the apparently V-shaped uncinate rami along the ostium of the aedeagus (Fig. 10A), and the strongly curved cornu of the spermatheca (Fig. 10C).

Description - male. Length 5.40–9.05 mm, width 2.00–3.50 mm, length/width ratio 2.58–2.70 (N=10), more elongate than oval, widest at humeri. Linear piliform scales relatively sparse, transparent white or yellow to light brown. With variable patterns of creamy white, gray metallic (several hues), light rusty brown (less abundant), and variously grayish or light to dark brown scales, particularly the creamy white and gray metallic scales have an underlying, greenish-turquoise-pinkish-yellowish iridescence ("opal gray"; cf. Lacordaire 1963b: 82). Rostrum length 0.70–1.12 mm, rostrum/pronotum length ratio 0.38–0.42, rostrum length/width ratio 0.78–0.80, depressed region basad of epistoma covered with pale pink metallic scales, thereafter increasingly with creamy white and variously brownish scales. Head (Fig. 9C) with eyes (only moderately) protruded, almost evenly globular, posteriorly not abruptly curved, rostrum and head in lateral view only moderately angulate. Pronotum (Fig. 9C) length/width ratio 1.00–1.22, pronotum/elytra length ratio 0.42–0.48, pronotum equilateral to elongate, relatively narrow and only slightly globular (subtubular in small males), anteriorly slightly constricted, punctures in posterior half of pronotum larger, subfoveate, scales dorsally predominantly darker (grayish and brown), laterally with wider, irregularly shaped and variously interspersed stripe of creamy white scales. Metendosternite more elongate than in *A. lateralis* (less laterally expanded), ventral margin nearly 2× wider than dorsal width of stalk, furcal arms diverging at nearly 30° in relation to medial keel. Profemur/pronotum length ratio 1.06–1.10, profemur with anteromesal tooth only moderately large (in comparison with males of congeneric species), triangular, protibia/profemur length ratio 0.96–1.00, anteromesal projection and associated teeth of protibia only weakly projected, basally rounded, scales predominantly creamy white and variously brown, interspersed with pale turquoise

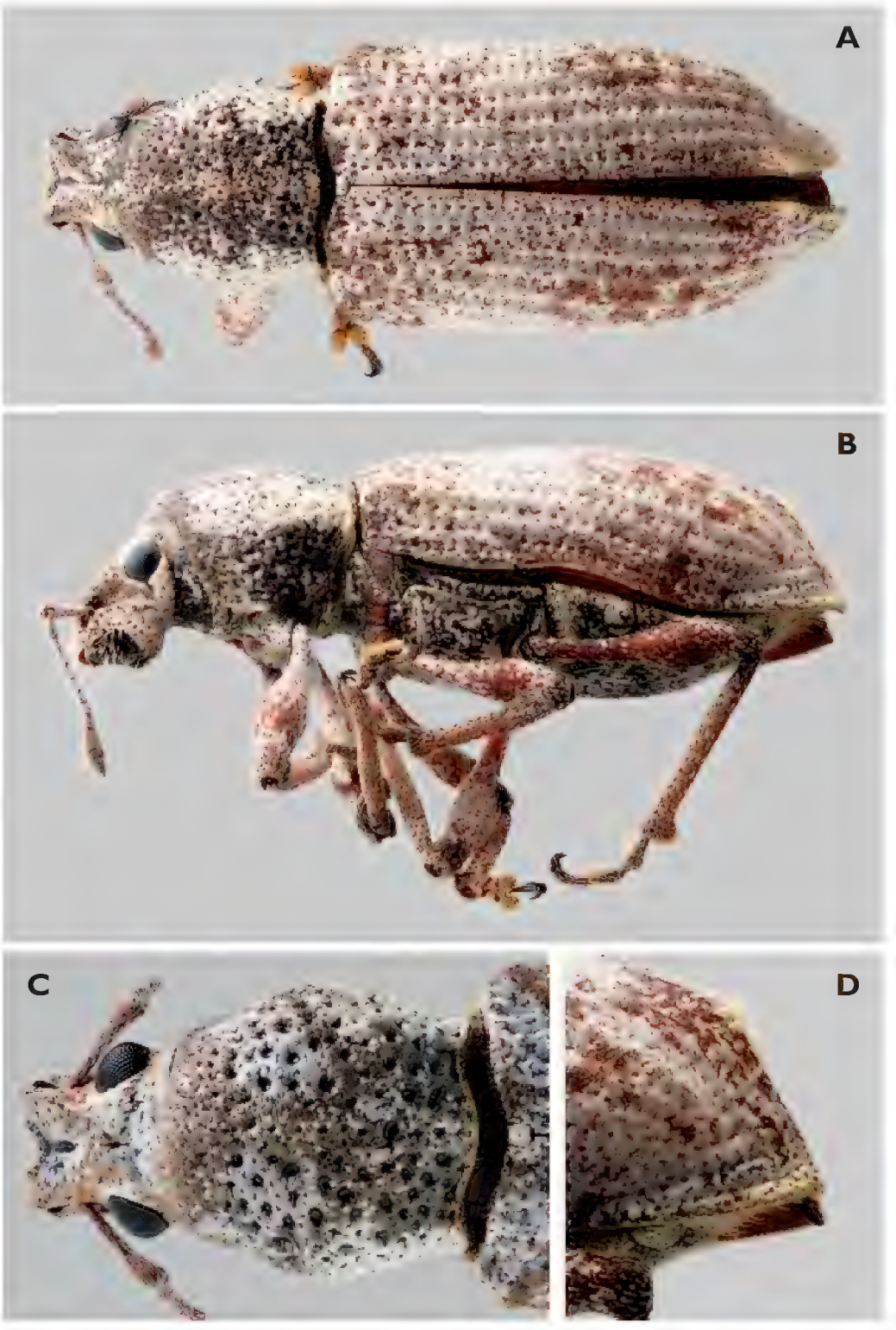

Figure 9. Habitus of *A. menocrater*: **A** female, dorsal view **B** female, lateral view **C** male, head and pronotum, dorsal view, showing subfoveate punctures **D** female, declivity with patch of suberect setae, lateral view.

and pinkish metallic. Elytra length/width ratio 1.78–1.92, more narrowly triangular in general appearance, widest at humeri, thereafter slightly yet continuously narrowed (attenuate), elytra predominantly with creamy white, gray metallic, and brown scales, each color varying in abundance and micro-patterns, in some specimens interspersed with light rusty brown and pale blue metallic scales, punctures with or without a creamy to transparent white scale. Wing/body length ratio 1.23–1.35, wing length/width ratio 3.30–3.62 (N=2).

Terminalia with sclerites of sternum VIII diamond-shaped, posterior margin strongly angulate. Spiculum gastrale with furcal arms apically strongly curved out-

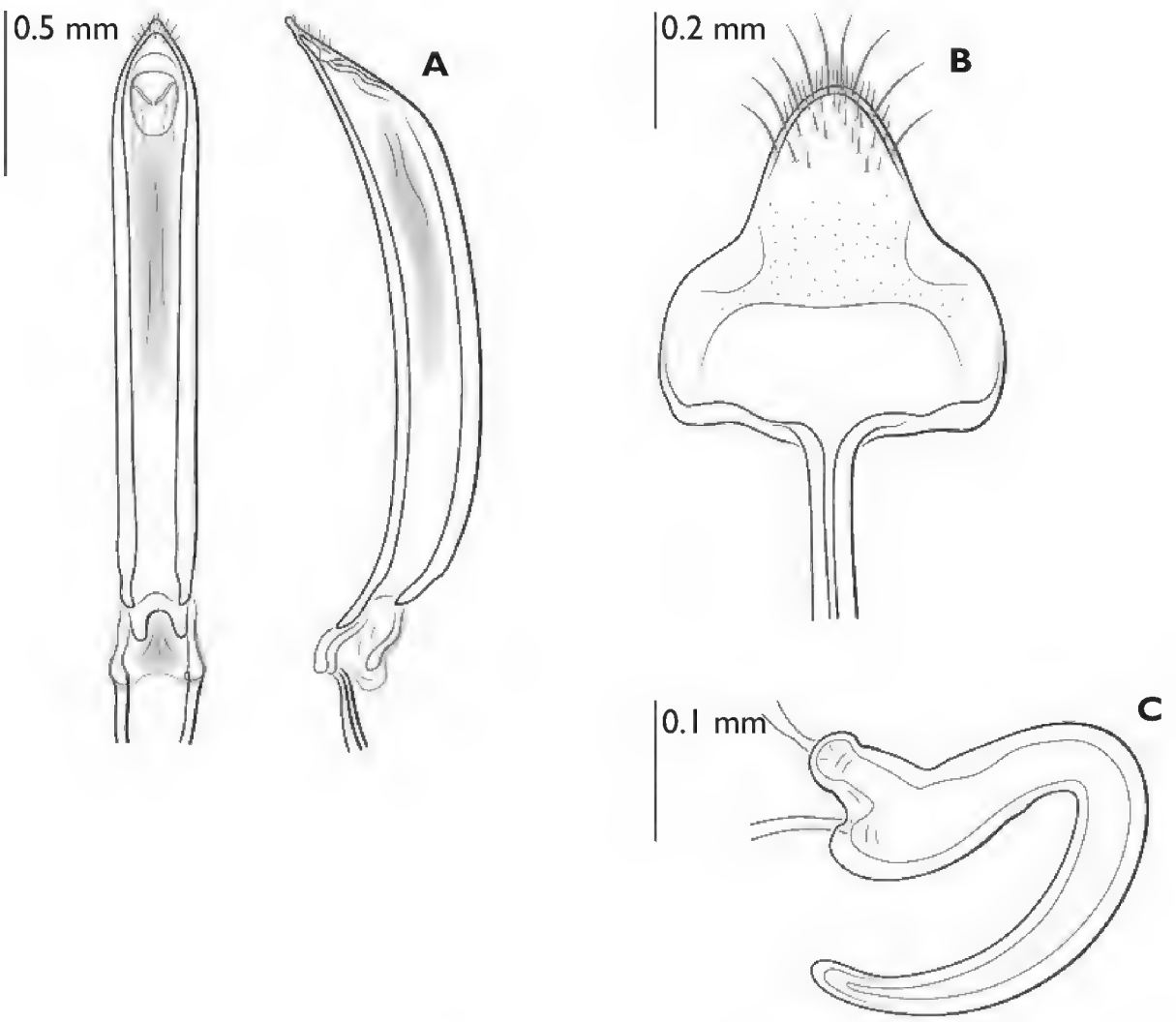

Figure 10. Terminalia of *A. menocrater*: **A** aedeagus, ventral and lateral view **B** sternum VIII, female **C** spermatheca.

wards. Aedeagus (Fig. 10A) with median lobe length/width relation 7.08–8.00 (N=5), lateral margins subparallel in basal 5/6 (greatest width near mid region), thereafter nearly straight and converging to very small, lobe-like, apically narrowly rounded projection. Median lobe in lateral view only slightly (though homogeneously) curved, mid region (second and third fourth of entire length) nearly straight, greatest width near base of ostium, apically with a small, very narrow lobe-like projection that is minimally expanded and reclined. Internal sac with 2 moderately sclerotized, uncinate, apically obliquely truncate rami, positioned in ostium and reclined mesally, creating the impression of a V-shaped transparent area in apical half of ostium.

Female. Largest specimens longer and wider than males, length 6.26–11.88 mm, width 2.15–4.60 mm, length/width ratio 2.58–2.92 (N=10), otherwise very similar to males. Rostrum length 0.75–1.33 mm, rostrum/pronotum length ratio 0.42–0.46, rostrum length/width ratio 0.78–0.80. Eyes slightly smaller than in males. Pronotum (Fig. 9A) length/width ratio 1.00–1.02, pronotum/elytra length ratio 0.37–0.39, pronotum less globular than in males, subtubular. Profemur/pronotum length ratio 1.06–1.10, profemoral tooth slightly smaller than in males, protibia/profemur length ratio 0.95–1.02, anteromesal projection and associated teeth only weakly developed. Elytra (Figs. 9A, 9D) length/width ratio 1.86–2.08, lateral margins subparallel in anterior half, thereafter gradually and roundly converging, mesal interval and stria I at point

just posteriad of anterior end of declivity with a small, subcircular, slightly elevated (convex) tuft with longer, suberect, linear, transparent white scales.

Terminalia with sternum VIII (Fig. 10B) with posterior 2/5 (lamina) triangular, anterior margins rounded, not projected, lateral margins sinuate, expanded ("alate") in anterior half, posterior setae relatively sparse. Spermatheca (Fig. 10C) U-shaped, ramus and collum angled at nearly 45°, subcontiguous, collum very short, ramus moderately long, corpus reduced, overall ("swollen"), cornu very long, very strongly angled/curved at basal 2/5, thereafter more gradually curved and continuously narrowed towards end which is positioned on the same plane yet oriented at nearly 180° in relation to proximal end of spermatheca.

Variation. This species is perhaps the most externally variable within the genus. Specimens differ in size by a factor of nearly two, and this variation is partly mirrored in larger specimens having a slightly more globular (as opposed to subtubular) pronotum and more conspicuously "armed" prolegs. The size, abundance and extension of subfoveate punctures on the pronotum are variable. However, the most dramatic intraspecific differences are manifested in the scale patterns and colors, ranging in general appearance from almost entirely "silver" (light opal gray scales) to tan and darker brown, yet also (less commonly) reddish or rusty brown, with many combinations of larger or more localized micro-patterns (resulting in a checkered appearance).

Material examined. Male holotype "D. R. Pedernales, Las Cuevas, Bahía de las Águilas Station, afternoon & night collecting (incl. Hg & UV lights), 40 m, N 17°51'43.8" W 71°38'18.3"/ Jun 08/2008 (RD 8–3), Leg. N. Franz, J. Girón, A. Mazo, S. Navarro" (UPRM). Paratypes, same label information as male holotype (CMNC: 1 male, 1 female; CWOB: 3 males, 3 females; FSCA: 1 male, 1 female; MNHD: 1 male, 1 female; NMNH: 1 male, 1 female; UPRM: 12 males, 3 females; WIBF: 1 male, 1 female); "DOMINICAN REPUBLIC, Pedernales Prov., Cabo Rojo, 18 May 1992, R. Turnbow" (CMNC: 1 female); "DOMINICAN REPUBLIC, Pedernales Prov., Cabo Rojo, 20 May 1992, R. Turnbow" (CMNC: 1 male, 1 female); "DOMINICAN REPUBLIC, Pedernales Prov., Cabo Rojo, 21 May 1992, R. Turnbow" (CMNC: 1 male); "DOMINICAN REPUBLIC, Pedernales, 23–24 km. N Cabo Rojo, 535 m, 11 July 1996, R. Turnbow" (CMNC: 1 male); "REPUBLICA DOMINICANA, Pedernales, Oviedo, dry forest, 5–8-VI-2001, H. Takizawa" (MNHD: 1 male); "DOMINICAN REPUBLIC: Prov. Pedernales, Cabo Rojo, Alcoa, 1–3-VII-1998, R. E. Woodruff, *Lignum vitae* leaves" (FSCA: 2 males, 1 female); "DOMINICAN REPUBLIC: Pedernales Prov., PN Jaragua, 3 km S. of Los Tres Charcos, 99 m.; 17°48.063' N, 71°26.809' W, 16-VI-2005; Gino Nearns" (FSCA: 1 male); "REPUBLICA DOMINICANA, Pedernales, midway Oviedo-Cabo Rojo, dried busch [sic], 10-VI-2001, H. Takizawa" (MNHD: 1 male); "DOM. REP.: Prov. Pedernales, Cabo Rojo, 24–28 AUG 1988, in pool & at light, 0–10 m, M. A. Ivie, T. K. Philips & K. A. Johnson colrs." (WBIF: 3 males); "DOMIN. REP: Pr. Pedernales, 0.5 km N. Cabo Rojo, 18°00' N, 71°39' W, 140 ft., 10 JULY 1993, D. S. Sikes & R. P. Rosenfeld, uv light" (WBIF: 1 male); "DOMIN. REP: Prov. Pedernales, P. N. Jaragua, Savana del Plato, 17°55.480' N, 71°30.983' W, 12.2 km N. Oviedo, 28 JULY 1999, G. Domini-

ci, beating pimenta" (WBIF: 1 male); "DOMIN. REP: Pr. Pedernales, P. N. Jaragua, "El Papayo", 17°54.252' N, 71°30.688' W, 29 JULY 1999, 195 m, G. Dominici, on Pimenta" (WBIF: 2 males, 1 female).

Etymology. Named for the characteristic, subfoveate punctures on the pronotum that resemble a moon crater landscape, with *mene* signifying "moon" and *krater* signifying "vessel, crater" (Brown 1956).

Natural history. *Apotomoderes menocrater* is known to occur in the lower elevation coastal dry forest habitats of the southwestern Pedernales province of the Dominican Republic: Jaragua National Park, Cabo Roho, Los Tres Charcos, and Oviedo (Fig. 18). The species likely also occurs in southern Haiti (cf. Lacordaire 1963b: 82). Label information (G. Dominici) suggests an association of adults with "lignum vitae" ("guayacán"; *Guaiacum officinale* Linnaeus – Zygophyllaceae) and "pimenta" ("allspice"; *Pimenta* Lindley – Myrtaceae); although the specific host plant associations remain unknown.

***Apotomoderes sotomayorae* Franz, sp. n.**
urn:lsid:zoobank.org:act:B4C96D33-0D16-4E62-B44F-57B7826E7EC6
Figs. 11, 12

Diagnosis. *Apotomoderes sotomayorae,* the only species occurring on Mona Island, is most readily separated from other congeners by the presence of regularly appearing, creamy white scales along the elytral striae (Fig. 11A; less distinctive in females). Other diagnostic features include the presence of transparent scales, particular on the pronotum of males (Fig. 11B), the lack of a pronounced elytral declivity in males and females (Fig. 11C), the apically triangular, point-like aedeagus (Fig. 12A), and the relatively narrow triangular lamina of the sternum VIII in females (Fig. 12B). Large males of similarly shaped species (*A. lateralis, A. chariedris,* and *A. hadroprion*) have a basally triangularly projected (as opposed to rounded) protibial ridge.

Description - male. Length 7.40–10.70 mm, width 3.15–4.95 mm, length/width ratio 2.15–2.45 (N=5). Integument with legs dark reddish brown (slightly lighter). Linear piliform scales sparse, transparent white. With distinct, heterogeneous pattern of uniformly arranged, or locally interspersed, transparent, creamy white, light brown, and pale blue metallic scales, the latter of various lighter to darker hues. Rostrum length 0.78–1.28 mm, rostrum/pronotum length ratio 0.30–0.36, rostrum length/width ratio 0.74–0.82, depressed region basad of epistoma covered primarily with pale blue metallic scales, thereafter increasingly with creamy white scales, lateral region anteriad of eye with patch of light brown scales, sulcus reduced, region adjacent to mandibular incision with pale blue metallic scales. Head with eyes small, slightly "tilted" posteriad, separated (in dorsal view) by distance slightly more than 2× anterior-to-posterior length of each eye, scales on head predominantly creamy white and light brown. Pronotum (Fig. 11A) length/width ratio 0.80–0.98, pronotum/elytra length ratio 0.45–0.50, pronotum strongly globular, mesally with large,

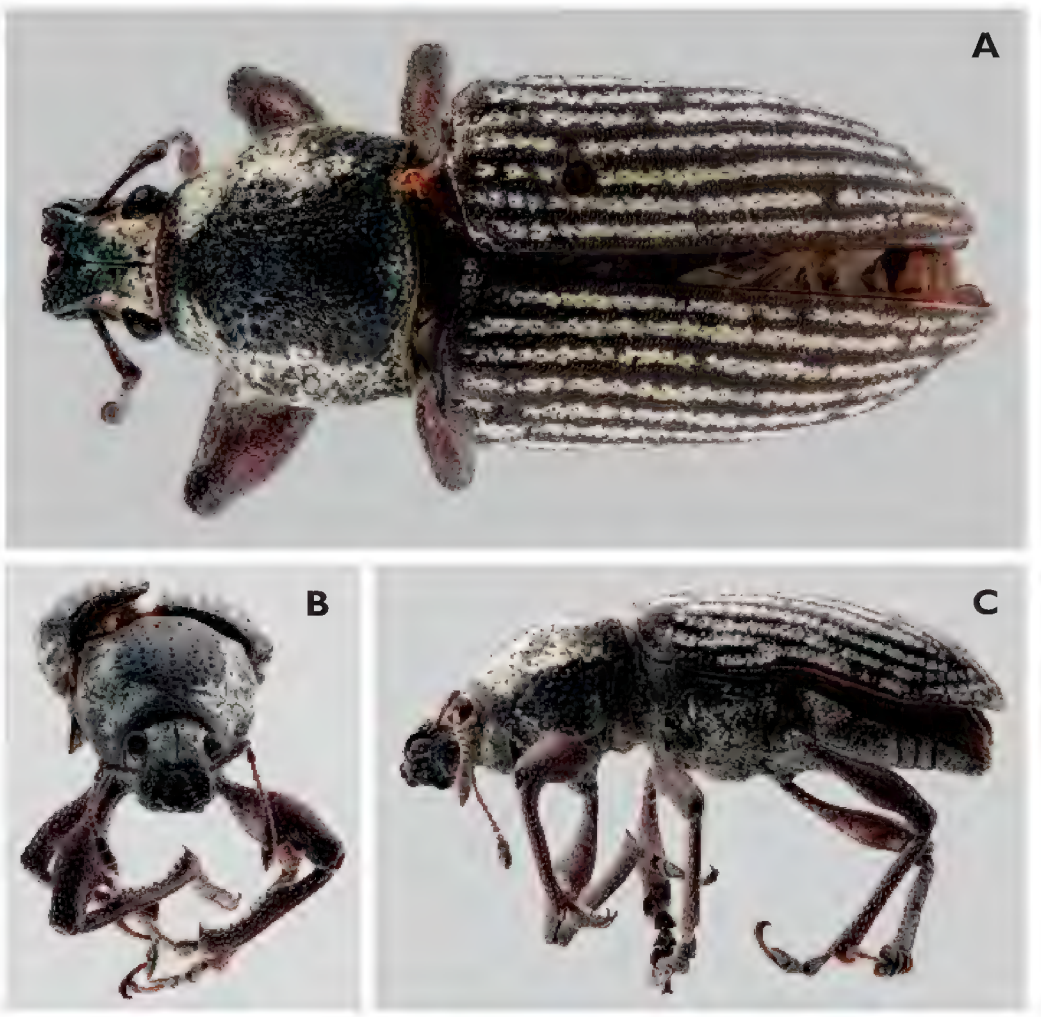

Figure 11. Habitus of *A. sotomayorae,* male: **A** dorsal view **B** frontal view **C** lateral view.

suboval region covered with pale blue metallic scales, or seemingly "glabrous" (only with transparent, slightly iridescent scales), and laterally with a wide, slightly undulating stripe of creamy white scales, thereafter (ventrad) predominantly "glabrous" (see above). Thoracic and ventral sterna predominantly covered with creamy white scales, interspersed with pale blue metallic scales. Metendosternite more elongate than in *A. lateralis* (less laterally expanded), ventral margin nearly 2× wider than dorsal width of stalk, furcal arms diverging at nearly 30° in relation to medial keel. Profemur/pronotum length ratio 0.80–0.94, profemur (Fig. 11 B) with anteromesal tooth very large, almost planate, slightly curved, protibia/profemur length ratio 1.00–1.02, anteromesal projection of protibia (Fig. 11B) distinct yet basally rounded, scales typically less dense on legs, creamy white and pale blue metallic. Elytra (Figs. 11A, 11C) length/width ratio 1.52–1.68, posterior declivity not pronounced, nearly indistinct, elytra with characteristic scale pattern: intervals seemingly glabrous, with slightly iridescent, transparent scale "remnants" (not protruding from cuticle), striae predominantly with creamy white scales, interspersed with pale blue metallic and pale yellow scales (near punctures), punctures with a greenish to yellowish metallic scale. Wing/body length ratio 1.25, wing length/width ratio 3.45 (N=1).

Terminalia with tegmen similar in length to median lobe. Aedeagus (Fig. 12A) with median lobe length/width relation 6.12–6.85 (N=3), basiventral margin strongly emarginate, lobe-like projections subtriangular, lateral margins very slightly diverging in basal 5/6 of entire length, thereafter nearly straight and triangularly converging

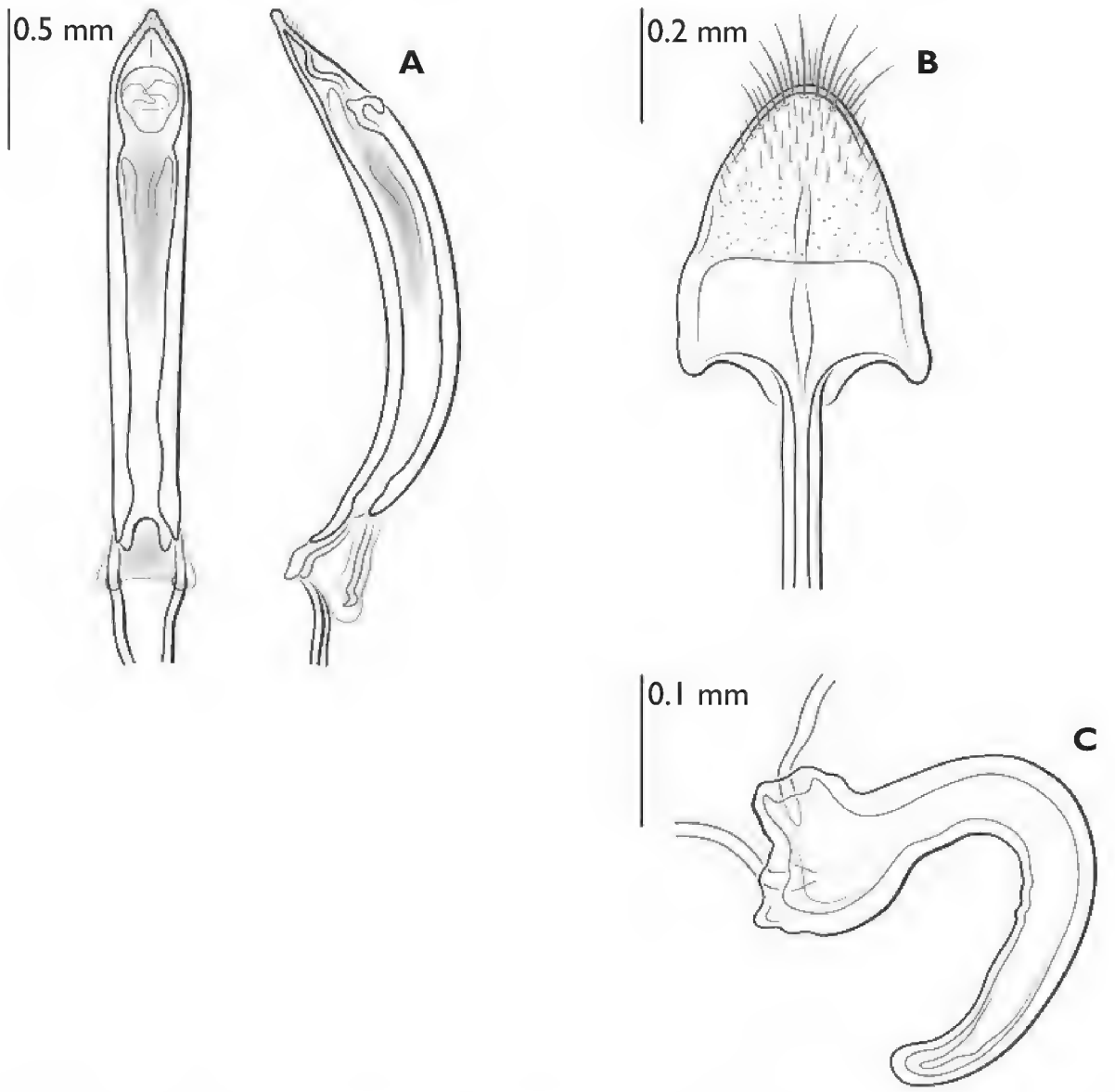

Figure 12. Terminalia of *A. sotomayorae*: **A** aedeagus, ventral and lateral view **B** sternum VIII, female **C** spermatheca.

towards point-like, through very narrowly rounded apex. Median lobe in lateral view apically with small, knob-like projection that is neither expanded nor reclined. Internal sac with 2 weakly sclerotized, angulate-uncinate rami, positioned in ostium and reclined mesobasally.

Female. Length 7.66–9.04 mm, width 2.82–3.40 mm, length/width ratio 2.58–2.72 (N=3). Pattern of scale colors varying considerably from that of males: rostrum, pronotum, sterna, legs, and elytra more homogeneously and densely covered with scales of multiple colors including creamy white, pale yellow (rare), light rusty brown, dark brown (as opposed to transparent), pale blue metallic, and yellow-light-green-pink metallic. Scale colors arranged in semi-consistent patterns though particularly variable among specimens on rostrum and pronotum, and transparent scales (present in males) absent on pronotum and elytra, therefore not appearing "glabrous" and with less conspicuous pronotal or strial scale stripes. Brown scales more prominent on rostrum (not just anteriad of eyes). Legs more consistently covered with creamy white, light rusty brown, and variously metallic scales. Region of elytra just posteriad of scutellum with patch of metallic scales. Rostrum length 0.85–0.98 mm, rostrum/pronotum length ratio 0.39–0.43, rostrum length/width ratio 0.76–0.80. Pronotum length/width ra-

tio 0.98–1.04, pronotum/elytra length ratio 0.36–0.38, pronotum considerably less globular than in males. Legs more slender than in males, profemur/pronotum length ratio 0.98–1.08, profemoral tooth (much) smaller and more triangular than in males, protibia/profemur length ratio 0.97–1.03, anteromesal projection and associated teeth of protibia less pronounced. Elytra length/width ratio 1.80–1.93, posterior declivity similarly unpronounced as in males.

Terminalia with lamina of sternum VIII (Fig. 12B) triangular, longer than wide, anterior margins projected, mesally with elongate, transparent (not sclerotized) region, posterior margin narrowly truncate. Coxites small, suboval. Spermatheca (Fig. 12C) nearly V-shaped, ramus and collum angled at nearly 150°, ramus short and wide, truncate, cornu strongly curved at basal 2/5, thereafter nearly straight until apical 1/8 which is more curved.

Variation. Males vary considerably in size, and several presumably allometric characteristics – viz. expansion of the pronotum, profemoral and protibial teeth, posterior attenuation of elytra – are less pronounced in smaller males. In some males yellow scales are more abundant in the lateral pronotal area. The relative abundance of creamy white, light rusty brown, and dark brown scales varies in females, particularly on the elytra, thus making the appearance of alternating stripes of darker scales (intervals) and lighter scales (stria) more or less obvious.

Material examined. Male holotype "Mona Island (PR, USA), Bajura Los Cerezos, 45 m, general collecting, N 18°05'18", W 67°54'04", leg. N. Franz, V-22–2008" (UPRM). Paratypes, same label information as male holotype (UPRM: 1 male, 2 females; CMNC: 1 male; CWOB: 1 male;); "PUERTO RICO, La Mona, III-8–1984, N. Virkki" (MEBT: 1 male); "PUERTO RICO, La Mona, 5-VI-1984, N. Virkki/ on citrus" (MEBT: 1 male)."Puerto Rico, Mona Island, Sendero Capitán, 40 m, at night, N 18°5'1", W 67°56'16", May 19–2008, Leg. N. Franz" (UPRM: 1 male; CWOB: 1 female).

Etymology. Named in honor of Sonia Maria Sotomayor, Associate Justice of the Supreme Court of the United States, whose personal story and academic and professional achievements are an inspiration for people in Puerto Rico and elsewhere.

Natural history. *Apotomoderes sotomayorae* is endemic to Mona Island, Puerto Rico (Fig. 18), where it is likely widespread, though not particularly abundant, in the plateau and depression forests (Cintrón and Rogers 1991). Most specimens were taken at night, on a variety of shrubs and trees.

Apotomoderes lateralis (Gyllenhal, 1834)

Figs. 1, 2, 3, 4, 5, 6

= *Apotomus lateralis* Gyllenhal 1834: 45 (first valid combination in Dejean 1834: 253)

Diagnosis. *Apotomoderes lateralis,* the type species, most closely resembles *A. chariedris* and *A. hadroprion* though it is slightly smaller than the latter two species, and has a

slightly less expanded male pronotum Fig. 1A). The scale patterns on the elytra are usually more homogeneous (initially appearing a one primary color) and less "spotty" (Figs. 2A, 2B). In addition, the aedeagus is apically more widely rounded, and the internal sac lacks well sclerotized rami along the ostium (Fig. 5D). The spermatheca is C-shaped (as opposed to more strongly curved), and has a short, tubular (as opposed to almost completely reduced) ramus (Fig. 6C). See also the species accounts of *A. chariedris* and *A. hadroprion.*

Description - male. Largely coinciding with the generic description above. Length 6.68–7.26 mm, width 2.26–2.86 mm, length/width ratio 2.54–2.68 (N=3). Scales variously interspersed creamy white to beige or tan to brown, often rather evenly interspersed or creating variable localized patterns, in some specimens with a more homogenous (and conspicuous) creamy white stripe laterally on pronotum and elytra. Rostrum length 0.75–0.85 mm, rostrum/pronotum length ratio 0.32–0.36, rostrum length/width ratio 0.72–0.78, depressed region basad of epistoma covered primarily with pinkish metallic scales. Head with eyes slightly "tilted" posteriad. Pronotum length/width ratio 0.96–1.02, pronotum/elytra length ratio 0.47–0.49, pronotum (strongly) globular, predominantly with beige to tan (mesal) and creamy white (mostly lateral) scales. Metendosternite wide (laterally expanded), ventral margin nearly 3× wider than dorsal width of stalk, furcal arms widely diverging at nearly 45° in relation to medial keel. Legs with scales less densely arranged, forming a more uniform light/dark/light pattern on femora, with pinkish metallic on anterior sides near tibial apices, profemur/pronotum length ratio 0.80–1.00, protibia/profemur length ratio 0.95–1.02, anteromesal projection of protibia basally triangular. Elytra length/width ratio 1.72–1.76, scales covering entire integument, arranged in mostly irregular micro-patterns of creamy white, beige, and brown colors, punctures with a green metallic scale. Wing/body length ratio 1.15–1.20, wing length/width ratio 3.63–3.78 (N=2).

Terminalia with tegmen (Fig. 5C) slightly shorter to slightly longer than median lobe. Aedeagus (Fig. 5D) with median lobe length/width relation 7.62–8.08 (N=3), basiventral margin with rounded projections, lateral margins subparallel to ostium, thereafter gradually and roundly converging, apex (widely) rounded. Median lobe in lateral view apically with small, knob-like, minimally deflexed projection. Internal sac without apparent rami.

Female. Largely coinciding with the generic description above. Length 6.34–8.20 mm, width 2.62–3.20 mm, length/width ratio 2.42–2.56 (N=3). Rostrum length 0.76–0.92 mm, rostrum/pronotum length ratio 0.38–0.42, rostrum length/width ratio 0.74–0.76. Pronotum length/width ratio 0.94–0.98, pronotum/elytra length ratio 0.40–0.43. Profemur/pronotum length ratio 1.02–1.04, protibia/profemur length ratio 0.96–1.00. Elytra length/width ratio 1.74–1.76.

Terminalia with lamina of sternum VIII (Fig. 6A) triangular, slightly longer than wide, anterior margins slightly projected, posterior margin narrowly rounded. Spermatheca (Fig. 6C) C-shaped, collum very short (reduced), collum subcontiguous with, and angled at nearly 90° in relation to, moderately long ramus, corpus very short and

expanded (widest), cornu continuously curved to end (at nearly 150° in relation to proximal orientation), gradually narrowed, apically very narrowly rounded.

Variation. The examined specimens vary primarily in the abundance of scales on the integument.

Material examined. Holotype specimen– female (only images seen: Fig. 2) "90. *Apotomoderes* Mannerh., *Apotomus* Schönherr 195. [box label 1]/ 1. *lateralis* Mannerh., Ghl. [Gyllenhal] 1. [box label 2]/ Typus [red, specimen label 1/ *Apotomoderes lateralis* S. [specimen label 2]" (located in the Naturhistoriska Riksmuseet, Stockholm, Sweden, NHRS). Additional specimens: "DOMINICAN REPUBLIC: Prov. La Altagracia, Cueva de Bernay, Boca de Yuma, 6-VI-1986, R. Miller & L. Strange" (CWOB: 1 male); "DOMINICAN REPUBLIC, San Pedro Prov., 13 km E. Boca Chica, 27-V-1992, coll. M.C. Thomas" (CWOB: 1 male); "D. R. San Pedro de Macoris, Rd. San Pedro de Macoris to Bocachica, along road-coast, 0 m, N 18°24'39.2" W 69°29'27.0"/ Jun 04/2008 (RD 4–3), Leg. N. Franz, J. Girón, A. Mazo, S. Navarro" (UPRM: 1 male); "DOM. REP., SPM, 21 km. W. S. Pedro de Macoris, May 30, 1978, CW & LB O'Brien & Marshall" (CWOB: 1 female); "DOMINICAN REPUBLIC, San Pedro Prov., 13 km E. Boca Chica, 27-V-1992, coll. M.C. Thomas" (CWOB: 2 females).

Etymology. The Latin term *lateralis* means "of the side" (Brown 1956), and may refer to the relatively well defined lateral stripe of creamy white scales on the pronotum and elytra of the female type specimen.

Natural history. *Apotomoderes lateralis* is known to occur in low elevation habitats in the southeastern provinces of the Dominican Republic (Fig. 18): La Altagracia (Boca de Yuma) and San Pedro de Macoris/Santo Domingo (east of Boca Chica). The host plant associations remain unknown.

Apotomoderes chariedris Franz, sp. n.

urn:lsid:zoobank.org:act:474D949C-484C-486C-8384-720979328F9B

Figs. 13, 14, 15

Diagnosis. *Apotomoderes chariedris* closely resembles *A. hadroprion* though it has a more metallic appearance, particularly in males (e.g. Fig. 13A). The pronotum is strongly globular (Figs. 13A, 14A) and the protibial ridge is distinctly triangular near the basal 2/5, particularly in large males (Fig. 13C). In addition, the apex of the aedeagus is narrowly rounded though not pointed, and in lateral view forms a small, knob-like (as opposed to lobe-like), slightly deflexed projection (Fig. 15A). Two mesally reclined, uncinate rami are present along the aedeagal ostium. The cornu of the spermatheca is abruptly angled at the basal one third (Fig. 15C), thereafter only slightly curved, and ending in a straight, slightly deflected tip (as opposed to gradually curved throughout). See also the species accounts of *A. chariedris* and *A. hadroprion*.

Description - male. Length 8.90–9.70 mm, width 3.58–3.78 mm, length/width ratio 2.38–2.60 (N=3). Linear piliform scales more dense on pronotum, very short, appressed, transparent white; setae (much) longer and suberect on thoracic and ventral

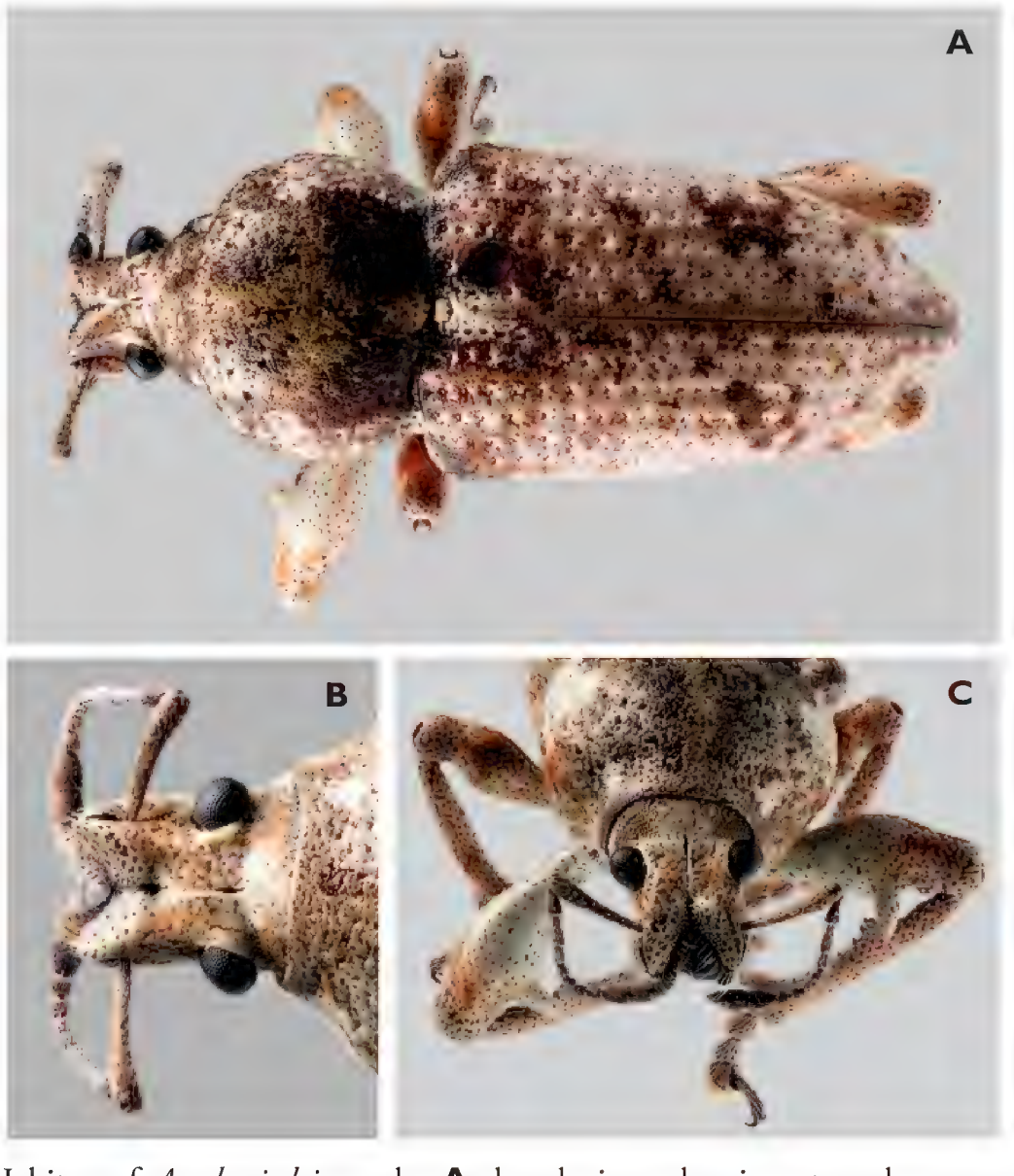

Figure 13. Habitus of *A. chariedris,* male: **A** dorsal view, showing strongly expanded pronotum **B** head, dorsal view **C** frontal view, showing large profemoral tooth and toothed, triangularly projected protibial ridge.

sterna and coxae. Scales predominantly creamy white, with a subtle iridescence, creating an almost silver effect, variously interspersed with rusty brown (localized, rare), tan, dark brown (more frequent, patchy/spotty) and turquoise (green to light blue) metallic scales (particularly as a secondary color on pronotum, anterior side of profemora), depressed region basad of epistoma covered primarily with creamy white to turquoise metallic scales, thereafter increasingly with creamy white scales, lateral region anteriad of eye with patch of light brown scales, sulcus reduced, region adjacent to mandibular incision with pale blue metallic scales. Rostrum length 0.98–1.00 mm, rostrum/pronotum length ratio 0.31–0.33, rostrum length/width ratio 0.75–0.80. Head with eyes "tilted" posteriad, particularly in large males. Pronotum length/width ratio 0.91–0.97, pronotum/elytra length ratio 0.48–0.52, globular and strongly convex, dorsally with irregularly shape scales of various colors including dark brown and pale blue metallic patches, in some specimens laterally (posterior half) with a wide, more uniformly creamy white "stripe", flanked by darker regions. Profemur/pronotum length ratio 0.90–0.98, profemur (Fig. 13C) with (minimally) anterior side often covered in part with turquoise scales, with anteromesal tooth very large, also completely covered with

Figure 14. Habitus of *A. chariedris,* male: **A** lateral view **B** ventral view.

scales, protibia/profemur length ratio 0.98–1.02, anteromesal projection of protibia (Fig. 13C) strongly and triangularly elevated (not rounded), associated teeth large, apically rounded to truncate. Elytra (Fig. 13A) length/width ratio 1.66–1.68, scales predominantly creamy white, often with turquoise metallic undertones, mesal striae more beige or tan, and with distinct though irregularly positioned and shaped dark brown spots, punctures also with a small, turquoise metallic scale.

Terminalia with tegmen similar in length to median lobe. Aedeagus (Fig. 15A) length/width relation 6.38–6.74 (N=2)., basiventral margin strongly emarginate, lobe-like projections elongate and subtriangular, lateral margins very slightly diverging in basal 5/6 of entire length, thereafter slightly rounded and continuously converging towards relatively narrowly rounded, though not pointed, apex. Median lobe in lateral view only slightly curved along extended mid region (second and third fourth of entire length), thereafter (apical fourth) dorsal margins converging towards apex in a straight slightly concave line, apically with very small, knob-like, minimally deflexed and expanded projection. Internal sac with 2 weakly sclerotized, angulate-uncinate rami, positioned in ostium and reclined mesally.

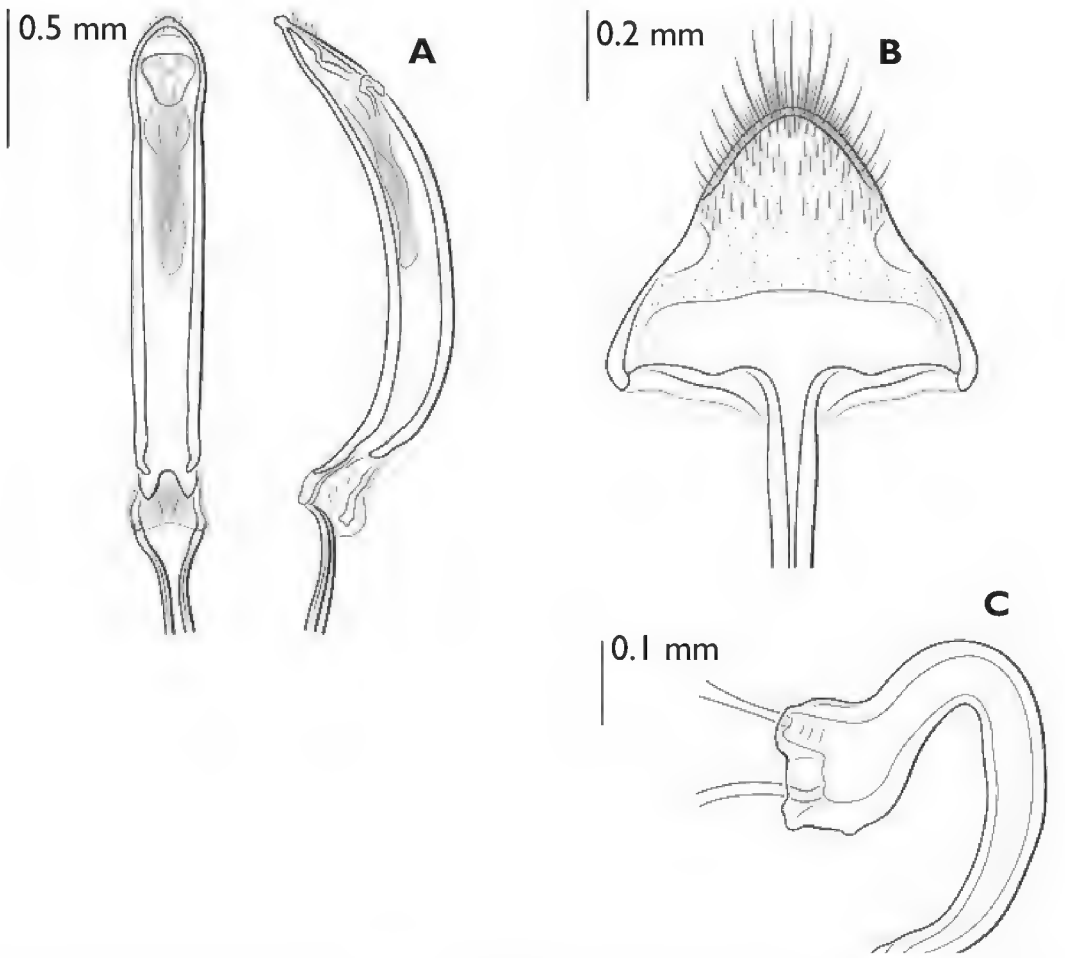

Figure 15. Terminalia of *A. chariedris*: **A** aedeagus, ventral and lateral view **B** sternum VIII, female **C** spermatheca.

Female. Length 7.58–10.70 mm, width 2.96–4.42 mm, length/width ratio 2.42–2.56 (N=3). Pattern of scale colors varying considerably from that of males: overall scales with beige and (light reddish) tan tomes more abundant, not appearing silver, scale distribution more finely heterogeneous, lighter and darker colors (including pale blue metallic) continuously interspersed, resulting in a "salt-and-pepper" appearance. Rostrum length 0.83–1.11 mm, rostrum/pronotum length ratio 0.35–0.40, rostrum length/width ratio 0.74–0.80. Eyes slightly smaller and more separated than in males. Pronotum length/width ratio 0.93–0.97, pronotum/elytra length ratio 0.40–0.42, pronotum only moderately globular. Profemur/pronotum length ratio 1.00–1.05, profemoral tooth (slightly) smaller than in males, protibia/profemur length ratio 0.96–0.98, anteromesal projection of protibia conspicuous and triangular, though slightly smaller than in males. Elytra length/width ratio 1.70–1.82.

Terminalia with lamina of sternum VIII (Fig. 15B) widely triangular, length and width similar, anterior margins projected, lateral margins slightly sinuate, posteriorly widely rounded, densely setose. Spermatheca (Fig. 15C) widely ?-shaped, ramus and collum angled at nearly 90°, subcontiguous, collum very short, rounded, ramus also very short, rounded, corpus reduced though expanded (widest region of spermatheca), cornu long, abruptly angled at basal one third, thereafter slightly curved and gradually narrowed, ending (apical 1/8) in a narrow, straight, slightly deflected tip.

Variation. The examined males vary primarily in the abundance of darker brown scales on the pronotum (spotty to predominant) and elytra (near absent to very con-

spicuous); one specimen has multiple patches of rusty brown scales on the legs. The females differ more strongly in size and in the overall scale color appearance, with some females have a more bluish white or rusty orange brown pattern.

Material examined. Male holotype "DOMINICAN REPUBLIC, RD-55 ~ 2 km N Bayahibe, La Altagracia Prov., 31.vii.2002, 18°23.423' N, 68°50.453' W, D. Perez, R. Bastardo, B. Hierro" (MHND). Paratypes, same label information as male holotype (MHND: 2 males, 3 females).

Etymology. Named for the visually appealing scale colors and patterns, with *charieis* signifying "graceful" (Brown 1956), and the inserted letters *dr* (*charie-DR-is*) representing the initials of the Dominican Republic where the species occurs. The epithet is treated as an adjective.

Natural history. *Apotomoderes chariedris* is known to occur in coastal, humid forest habitats of the southeastern La Altagracia Province (Bayahibe, Parque del Este) of the Dominican Republic (Fig. 18). The host plant associations remain unknown.

Apotomoderes hadroprion Franz, sp. n.

urn:lsid:zoobank.org:act:D44A955A-4F65-442C-B738-0C83D5FFBFCF
Figs. 16, 17

Diagnosis. *Apotomoderes hadroprion* closely resembles *A. chariedris* though it has a more patchy beige/dark brown scale pattern on the elytra (Fig. 16A). The pronotum is strongly globular (Fig. 16B) and the protibial ridge is distinctly triangular near the basal 2/5, particularly in large males. In addition, the apex of the aedeagus is point-like and not just narrowly rounded, and in lateral view forms a small, lobe-like (as opposed to knob-like) projection that is neither expanded nor reclined (Fig. 17A). Two mesally reclined, uncinate rami are present along the aedeagal ostium. The cornu of the spermatheca is strongly curved at the basal 2/5 (Fig. 17C), and thereafter gradually curved towards the tip (as opposed to apically slightly deflected). See also the species accounts of *A. chariedris* and *A. hadroprion.*

Description - male. Length 8.85–9.58 mm, width 3.15–3.40 mm, length/width ratio 2.60–2.80 (N=2). Scale colors and patterns, to the extent that they are apparent in the available specimens (see remarks on variation), very similar to those of *A. lateralis,* with pale pink metallic scales restricted to depressed region basad of epistoma, with light green (or similar, yellowish, pinkish to pale blue) metallic scales more abundant on anterior sides of profemora. The pronotum (Fig. 16B) has a larger abundance of transparent scales, thus appearing "glabrous". The scale pattern on the elytra is slightly more patchy (segregated), with white and beige scales predominating over semi-regular, subcircular to irregular sections of brown scales. Rostrum length 0.92–1.02 mm, rostrum/pronotum length ratio 0.32–0.36, rostrum length/width ratio 0.78. Head with eyes "tilted" posteriad. Pronotum length/width ratio 0.88–0.98, pronotum/elytra length ratio 0.48–0.52, strongly globular and seemingly transverse (short and wide), anteriorly strongly constricted. Profemur/pronotum length ratio

Figure 16. Habitus of *A. hadroprion,* male: **A** lateral view **B** frontal view, showing posteriorly "tilted" eyes.

0.90–1.00, profemur stout, with anteromesal tooth very large, protibia/profemur length ratio 0.98–1.02, anteromesal projection of protibia strongly elevated, triangular, associated teeth large, apically rounded to truncate. Elytra length/width ratio 1.68–1.72, punctures with a small, greenish to turquoise metallic scale (no longer visible in very old specimens).

Terminalia with furcal arms of spiculum gastrale apically strongly curved outwards. Tegmen similar in length to median lobe. Aedeagus (Fig. 17A) with median lobe length/width relation 6.-44–6.88 (N=1), basiventral margin strongly emarginate, lobe-like projections elongate and subtriangular, lateral margins slightly diverging in basal 5/6 of entire length, thereafter slightly rounded and gradually (triangularly) converging towards point-like, through very narrowly rounded apex. Median lobe in lateral view only slightly curved along extended mid region (second and third fourth of entire length), thereafter (apical fourth) dorsal margins converging towards apex in a slightly concave line, apically with very small, lobe-like, narrowly rounded projection that is neither expanded nor reclined. Internal sac with 2 weakly sclerotized, angulate-uncinate rami, positioned in ostium and reclined mesobasally.

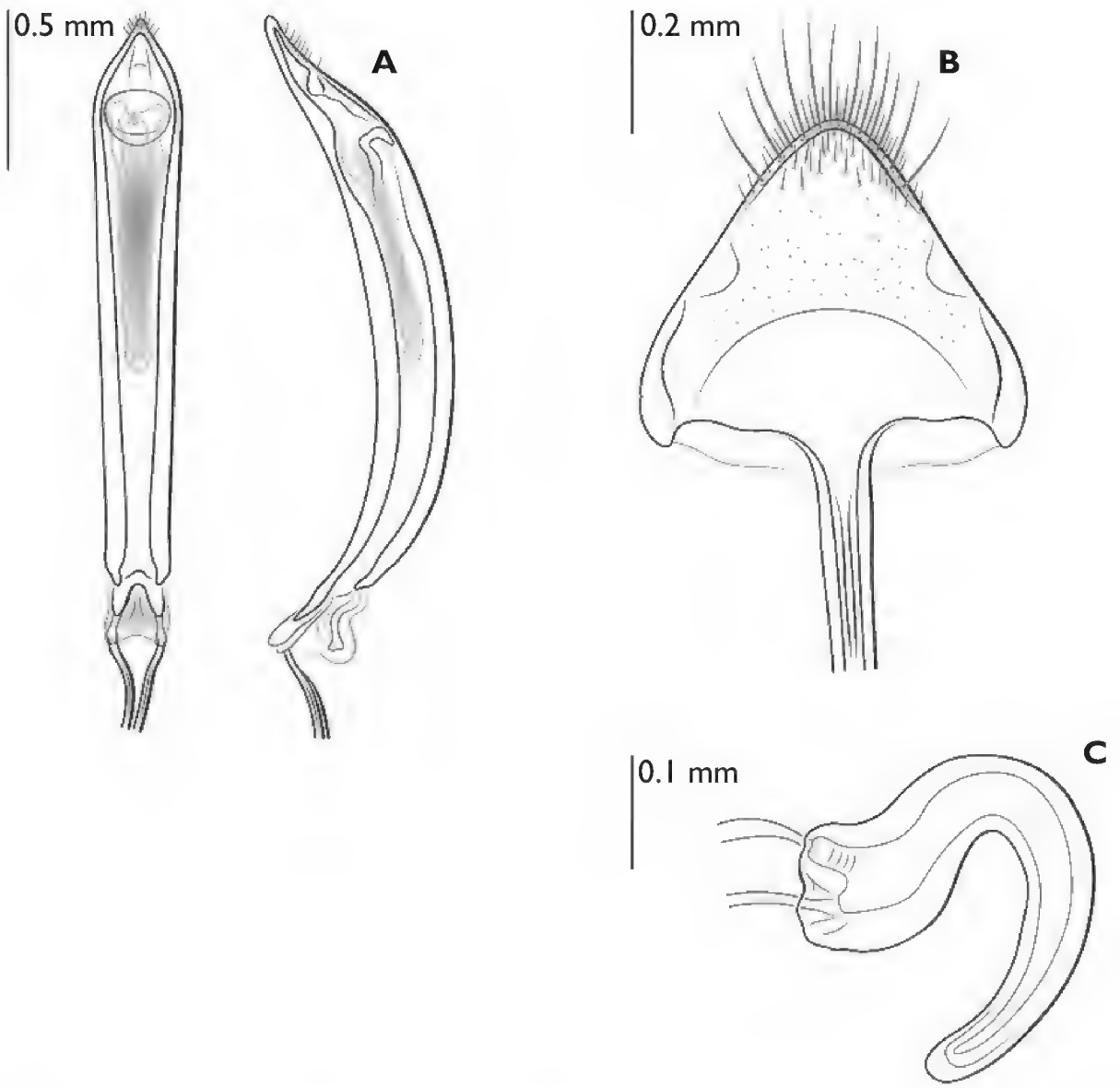

Figure 17. Terminalia of *A. hadroprion*: **A** aedeagus, ventral and lateral view **B** sternum VIII, female **C** spermatheca.

Female. Length 9.24–9.38 mm, width 3.73–3.78 mm; length/width ratio 2.48 (N=2). Rostrum length 1.04–1.10 mm, rostrum/pronotum length ratio 0.39–0.41, rostrum length/width ratio 0.80–0.82. Pronotum length/width ratio 0.92; pronotum/elytra length ratio 0.40–0.42, pronotum smaller, less wide and less globular than in males. Profemur/pronotum length ratio 0.98–1.00, profemoral tooth slightly shorter and more equilaterally triangular, protibia/profemur length ratio 1.00–1.02, anteromesal projection and associated teeth of protibia slightly less pronounced than in males. Elytra length/width ratio 1.75–1.78.

Terminalia with lamina of sternum VIII (Fig. 17B) widely triangular, all sides almost exactly equilateral, anterior margins projected, anterior half with 2 lateral, poorly defined transparent regions. Spermatheca (Fig. 17V) nearly V-shaped, ramus and collum angled at nearly 60°, each very short (reduced) and wide, resulting in a subcontiguous, uniformly swollen structure (corpus reduced), cornu strongly curved at basal 2/5, thereafter more gradually curved and continuously narrowed towards end.

Variation. Except for the male holotype, all available specimens are nearly 30 years old and appear highly worn, with many regions appearing "glabrous" in light of abrasion and other structural changes of the scales, thereby exposing the color of the un-

derlying integument (particularly the pronotum and elytra) through a transparent, wax-like cover. Consequently, the original variation in scale color pattern cannot be assessed.

Material examined. Male holotype "DOMINICAN REPUBLIC: La Altagracia Prov, El Veron, rd. to Hoyo Azul, 26.VI.2005, 18°34.805' N, 68°26.543' W, 40 m, leg. A. Konstatinov, L. Chamorro" (NMNH). Paratypes, same label information as male holotype (MHND: 1 male); "Juan Dolio, S. P. Macoris, PROV. S. P. Macoris, R. D., 29-VI-1980, Col. Dguez/ 19813" (MHND: 1 female); "Juan Dolio, S. P. Macoris, PROV. S. P. Macoris, R. D., 29-VI-1980, Col. Dguez/ 19815" (MHND: 1 female).

Etymology. Named for the particularly prominent row of teeth on the protibia, with *hadros* signifying "well developed", and *prion* signifying "saw" (Brown 1956). The epithet is treated as a noun in apposition.

Natural history. *Apotomoderes hadroprion* is known to occur in low elevation habitats in two southeastern provinces of the Dominican Republic (Fig. 18): La Altagracia (Hoyo Azul) and San Pedro de Macoris (Juan Dolio). The host plant associations remain unknown.

Key to the species of *Apotomoderes*

1. Length 4.32–6.28 mm; profemur unarmed (Fig. 7C); protibia lacking a ridge-like projection; aedeagus with rami along ostium curved outward (Fig. 8A); sternum VIII (female) slightly incised at posterior end of lamina (Fig. 8B) ..... ***A. anodontos* Franz, sp. n.**

1' Length 5.40–11.88 mm; profemur armed with a large, knife-like tooth (e.g. Fig. 2B); protibia with a ridge-like, toothed projection along anteromesal margin (e.g. Fig. 2B); aedeagus with rami along ostium curved inward (e.g. Fig. 12A); sternum VIII (female) with lamina posteriorly not incised..... **2**

2(1') Pronotum only slightly globular in males (Fig. 9C); pronotum with larger, subfoveate punctures in posterior half (Fig. 9C); elytral punctures without an iridescent metallic scale; elytra with a patch of suberect scales near mesal anterior end of declivity in females (Fig. 9D) ....***A. menocrater* Franz, sp. n.**

2' Pronotum strongly globular in males (e.g. Fig. 13A); pronotum without larger punctures; elytral punctures with an iridescent metallic scale (e.g. Fig. 13A); elytral punctures typically with an iridescent metallic scale; elytra without suberect scales near mesal anterior end of declivity in females **3**

3(2') Protibial projection rounded near basal 2/5 (Fig. 11B); elytra with regularly appearing, creamy white scale stripes along striae (Fig. 11A) ....***A. sotomayorae* Franz, sp. n.**

3' Protibial projection triangular near basal 2/5, particularly so in large males (e.g. Fig. 13C); elytra variously covered with scales though without pronounced creamy white stripes **4**

4(3') Length 6.68–8.20 mm; aedeagus apically (widely) rounded, internal sac without apparent rami (Fig. 5D); lamina of sternum VIII (female) longer than wide (Fig. 6A) and spermatheca with ramus moderately long, tubular (Fig. 6C) ..... ***A. lateralis* (Gyllenhal)**

4' Length 7.58–10.70 mm; aedeagus apically (very) narrowly rounded, internal sac with apparent rami (Figs. 15A, 17A); lamina of sternum VIII (female) nearly as wide as long (Figs. 15B, 17B) and spermatheca with ramus very short (Figs. 15C, 17C) **5**

5(4') Aedeagus with apex narrowly rounded though not pointed, in lateral view apex with a small, knob-like, minimally deflexed projection (Fig. 15A); spermatheca with cornu abruptly angled at basal one third, thereafter slightly curved and a straight, slightly deflected tip (Fig. 15C) .... ***A. chariedris* Franz, sp. n.**

5' Aedeagus with apex very narrowly rounded, point-like, in lateral view with a small, lobe-like projection is neither expanded nor reclined (Fig. 17A); spermatheca with cornu strongly curved at basal 2/5, thereafter more gradually curved towards end (Fig. 17C) ..... ***A. hadroprion* Franz, sp. n.**

Phylogenetic analysis

The 12-taxon matrix (Table 1) yielded a single most parsimonious cladogram (Fig. 19) with a length of 33 steps, a consistency index (CI) of 75 and a retention index (RI) of 90 (Farris 1989). The character states and inferred optimizations are presented simultaneously in this section. Due to limited outgroup representation, the discussion of synapomorphies is restricted to the ingroup taxa. Individual consistency and retention indices (ci, ri) are provided for all characters that are not shown as unreversed synapomorphies.

1. Scales, extent of coverage: (0) integument only partly or sparsely covered with scales; (1) integument densely and homogeneously covered with scales.
2. Labium, number of labial palpomeres: (0) with 3 labial palpomeres; (1) with 2 labial palpomeres. Synapomorphy for the species of *Apotomoderes.*
3. Rostrum, presence of median sulcus (dorsal view): (0) median sulcus absent or obscure (*L. kofresi*); (1) median sulcus well developed, deep and narrow.
4. Rostrum, shape of dorsal surface: (0) plane to slightly convex; (1) at least slightly concave.
5. Head, presence of postocular constriction: (0) absent; (1) present. Synapomorphy for the species of *Apotomoderes.*
6. Eyes, extent of protrusion: (0) eyes only slightly protruded; (1) eyes strongly protruded, globular. Convergently present in *L. kofresi* and in the *Artipus floridanus*-*Apotomoderes* clade (ci=50; ri=66).

Table 1. Character matrix for the cladistic analysis of the species of *Apotomoderes,* with selected outgroup taxa. All multistate characters are coded as additive; "–" represents inapplicable character states (see also text).

Taxon / character	5	10	15	20	
Exophthalmus quadrivittatus	00000	0-000	00000	00000	0-
Scelianoma elydimorpha	10100	0-000	00101	-0000	0-
Lachnopus kofresi	00000	10000	01000	10000	10
Lachnopus valgus	00000	0-000	00000	10000	10
Artipus floridanus	10110	10000	00110	10000	0-
Pantomorus elegans	10110	0-000	00100	00000	0-
Apotomoderes anodontos	11111	10100	01101	11100	10
Apotomoderes chariedris	11111	11212	11110	01211	11
Apotomoderes hadroprion	11111	11212	11110	01211	11
Apotomoderes lateralis	11111	11212	11110	01-01	10
Apotomoderes menocrater	11111	10111	11101	11200	10
Apotomoderes sotomayorae	11111	11211	11110	11201	10

7. Eyes, orientation of globular eyes: (0) eyes evenly spherical; (1) eyes "tilted" posteriad, posterior side nearly plane (not evenly spherical), particularly in large males. Coded as inapplicable for taxa that lack globular eyes (see character 6). Synapomorphy for the *A. sotomayorae-A. hadroprion* clade.
8. Pronotum, shape and sexual dimorphism: (0) shape of pronotum similar between males and females; (1) pronotum more expanded in males, slightly globular; (2) pronotum strongly globular in males. Coded as additive. Synapomorphy for the species of *Apotomoderes* (state 1) and for the *A. sotomayorae-A. hadroprion* clade (state 2), respectively.
9. Profemur, presence of 1 very large, knife-like cuticular tooth: (0) absent; (1) present. Synapomorphy for the *A. menocrater-A. hadroprion* clade.
10. Protibia, presence and shape of anteromesal projection: (0) anteromesal projection absent; (1) anteromesal projection present, rounded near basal 2/5 of protibia; (2) anteromesal projection present, triangular near basal 2/5 of protibia, especially so in large males. Coded as additive. Synapomorphy for the *A. menocrater-A. hadroprion* clade (state 1) and for the *A. lateralis-A. hadroprion* clade (state 2), respectively.
11. Protibia, shape of ventral teeth: (0) ventral teeth triangular, evenly spaced and similar throughout; (1) ventral teeth apically rounded to truncate, particularly near basal 2/5 of protibia. Synapomorphy for the *A. menocrater-A. hadroprion* clade.
12. Metatibial apex, presence of spines: (0) both inner flange and outer bevel with a row of spines ("corbel enclosed"); (1) without an inner flange or outer bevel with a row of spines ("corbel open"). Convergently present in *L. kofresi* and in the species of *Apotomoderes* (ci=50; ri=75).
13. Metatarsal condyle, presence of scales: (0) surface surrounding metatarsal condyle glabrous; (1) surface surrounding metatarsal condyle partially covered with scales.

14. Elytra, presence of a metallic scale in punctures: (0) absent; (1) present. Convergently present in *A. floridanus* and in the *A. sotomayorae-A. hadroprion* clade (ci=50; ri=75).
15. Elytra, presence of a patch of suberect, linear scales near mesal anterior end of declivity, in females only: (0) absent; (1) present. ACCTRAN optimization preferred (see Agnarsson and Miller 2008), therefore convergently present in *S. elydimorpha* and in the species of *Apotomoderes,* with a reversal in the *A. sotomayorae-A. hadroprion* clade (ci=33; ri=0).
16. Male terminalia, outline of lateral margins of median lobe in apical 1/4 (dorsal view): (0) lateral margins gradually rounded towards apex; (1) margins nearly straight, subparallel or triangularly converging. DELTRAN optimization preferred (see Agnarsson and Miller 2008), therefore convergently present in the two examined species of *Lachnopus* Schoenherr and in the in the *A. floridanus-Apotomoderes* clade, with a reversal in the *A. lateralis-A. hadroprion* clade (ci=33; ri=50).
17. Male terminalia, presence of setae in dorsal subapical region of median lobe: (0) absent; (1) present. Synapomorphy for the species of *Apotomoderes.*
18. Male terminalia, orientation of rami along ostium of median lobe: (0) rami subparallel, apically not strongly expanded; (1) rami apically uncinate, curved outward; (2) rami apically uncinate, curved inward. Coded as additive, inapplicable in *A. lateralis* (rami not apparent). Synapomorphy for the species of *Apotomoderes* (state 1) and for *A. menocrater-A. hadroprion* clade (state 2), respectively.
19. Female terminalia, shape of lamina of sternum VIII: (0) linear to narrowly triangular; (1) widely triangular, all sides nearly straight and equilateral. Synapomorphy for the *A. chariedris-A. hadroprion* clade.
20. Female terminalia, anterior edges of lamina of sternum VIII: (0) rounded, not projected; (1) anterior edges slightly projected. Synapomorphy for the *A. sotomayorae-A. hadroprion* clade.
21. Female terminalia, relative proximity of collum and ramus on spermatheca: (0) collum and ramus at least slightly separated, corpus not completely reduced; (1) collum and ramus subcontiguous, corpus reduced. Convergently present in the two examined species of *Lachnopus* Schoenherr and in the species of *Apotomoderes* (ci=50; ri=66).
22. Female terminalia, length of ramus of spermatheca: (0) ramus at least slightly projected, tubular; (1) ramus strongly reduced, nearly equate with surrounding surface of spermatheca. Coded as inapplicable in taxa where the collum and ramus are clearly separated (see character 21). Synapomorphy for the *A. chariedris-A. hadroprion* clade.

Historical biogeography

The known *Apotomoderes* species records (Fig. 18) suggest the presence of two areas of endemism with multiple species occurrences, i.e. the southwestern Dominican Re-

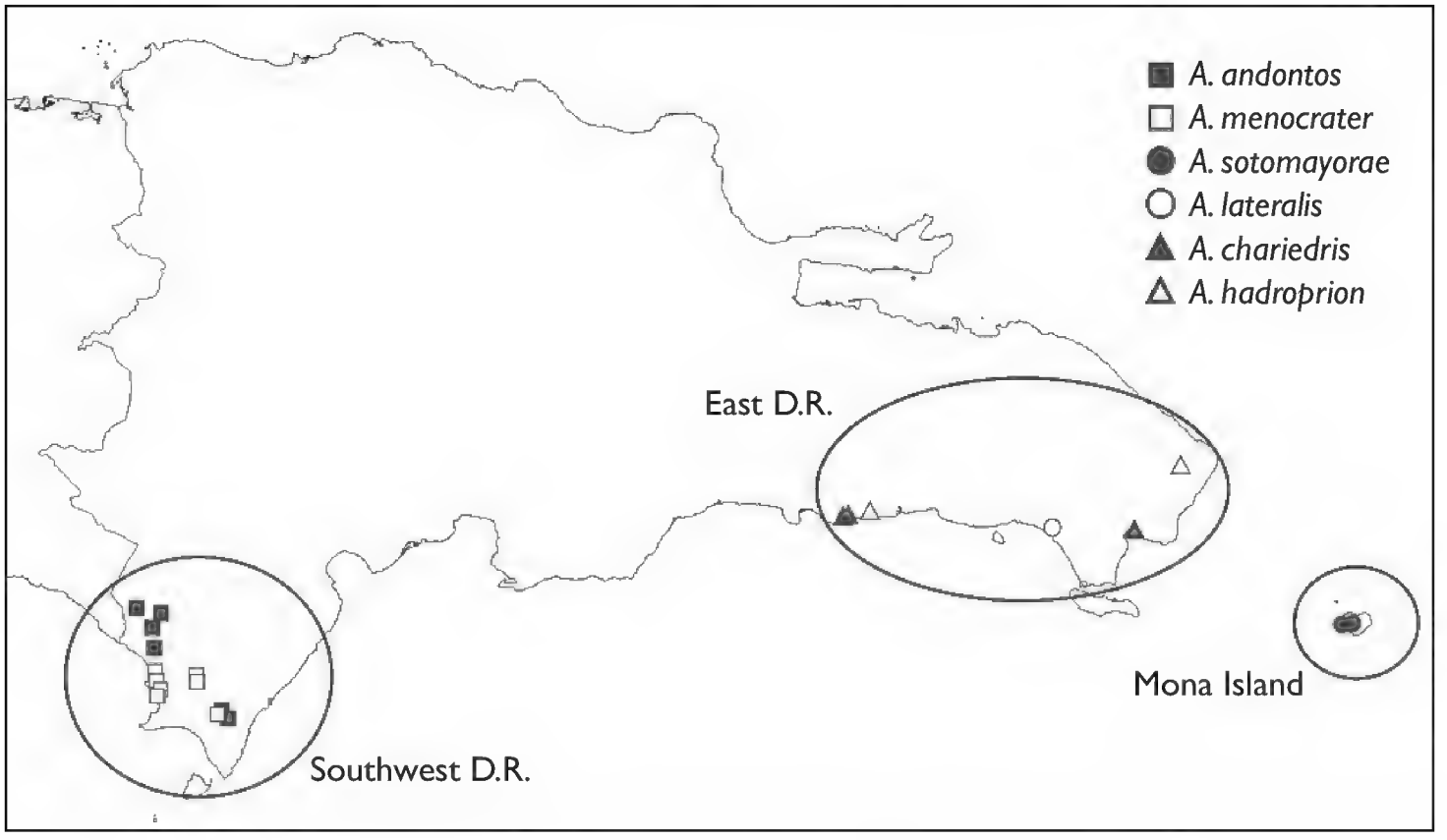

Figure 18. Reported occurrences and posited areas of endemism for the species of *Apotomoderes.*

public (Pedernales) and the eastern Dominican Republic (La Altagracia and San Pedro de Macoris), assuming that the habitat conditions of the latter area are sufficiently similar to sustain a wider distribution of (minimally) *A. lateralis* than herein reported. A third area of endemism, Mona Island (Puerto Rico), is inhabited by a single species, *A. sotomayorae* (Fig. 18). Consequently, component analysis (Component 1.5; see Page 1990) yields a single, unambiguous taxon-area cladogram with the southwestern Dominican Republic as sister area to the most closely associated eastern Dominican Republic and Mona Island areas (Fig. 20). *Artipus floridanus* from Florida and the Bahamas (O'Brien and Wibmer 1982) represents the outgroup.

Discussion

According to the preferred cladogram (Fig. 19), the monophyly of *Apotomoderes* is well supported by a series of putative synapomorphies; viz. two-segmented labial palps (char. 2), a postocular constriction on the head (char. 5), a more expanded pronotum in males (char. 8), the presence of setae in the dorsal subapical region of the aedeagus (char. 17), and the presence of (ancestrally) outwardly directed, uncinate rami along the ostium of the aedeagus (char. 18). Additional homoplasious traits that characterize the genus include the "open" metatibial corbel (char. 12), the presence of a patch of suberect scales on the female elytral declivity (char. 15; reversed in the *A. sotomayorae-A. hadroprion* clade), and the subcontiguous collum and ramus of the spermatheca (char. 21). This redefinition of *Apotomoderes* is more comprehensive and also slightly more inclusive than Schoenherr's (1834) and Lacordaire's (1863b) generic concepts

(cf. Franz and Peet 2009), given that it includes one species – *A. anodontos* – which lacks the large profemoral tooth (char. 9) and elevated and toothed protibial ridge (chars. 10, 11) of the remaining species including *A. lateralis.* The unique combination of modifications of the rostrum, eyes, head (chars. 3–8; e.g. Fig. 13) are sufficient to separate the genus taxonomically from all other Caribbean entimine genera. The species of the *S. sotomayorae-S. hadroprion* are furthermore differentiated by posteriorly "tilted" eyes (char. 7), a strongly globular pronotum in males (char. 8), and projected anterior edges of the lamina of the sternum VIII in females (char. 20). The presumably youngest species in the Hennigian comb-shaped topology, *A. chariedris* and *A. hadroprion,* are externally very similar and only distinguished by features of the terminalia.

Although *Apotomoderes,* as presently redefined, is a readily recognizable and monophyletic group, its immediate relatives and tribal placements remain uncertain. The inferred phylogeny (Fig. 19) places the genus closer to other naupactine genera, i.e. *Artipus* and *Pantomorus* Schoenherr, than to examined members of the Geonemini (= current tribal placement *sensu* Alonso-Zarazaga and Lyal 1999) and Eustylini. Such a placement is also indicated when using Anderson's (2002) key to the North American genera of Entiminae. Nevertheless, our knowledge of the phylogenetic limits of these tribes is judged too incomplete and the available character support too weak to warrant a tribal reallocation of *Apotomoderes* at this time (see also Marvaldi 1997; Franz 2010; Franz and Girón 2009). Likewise, the

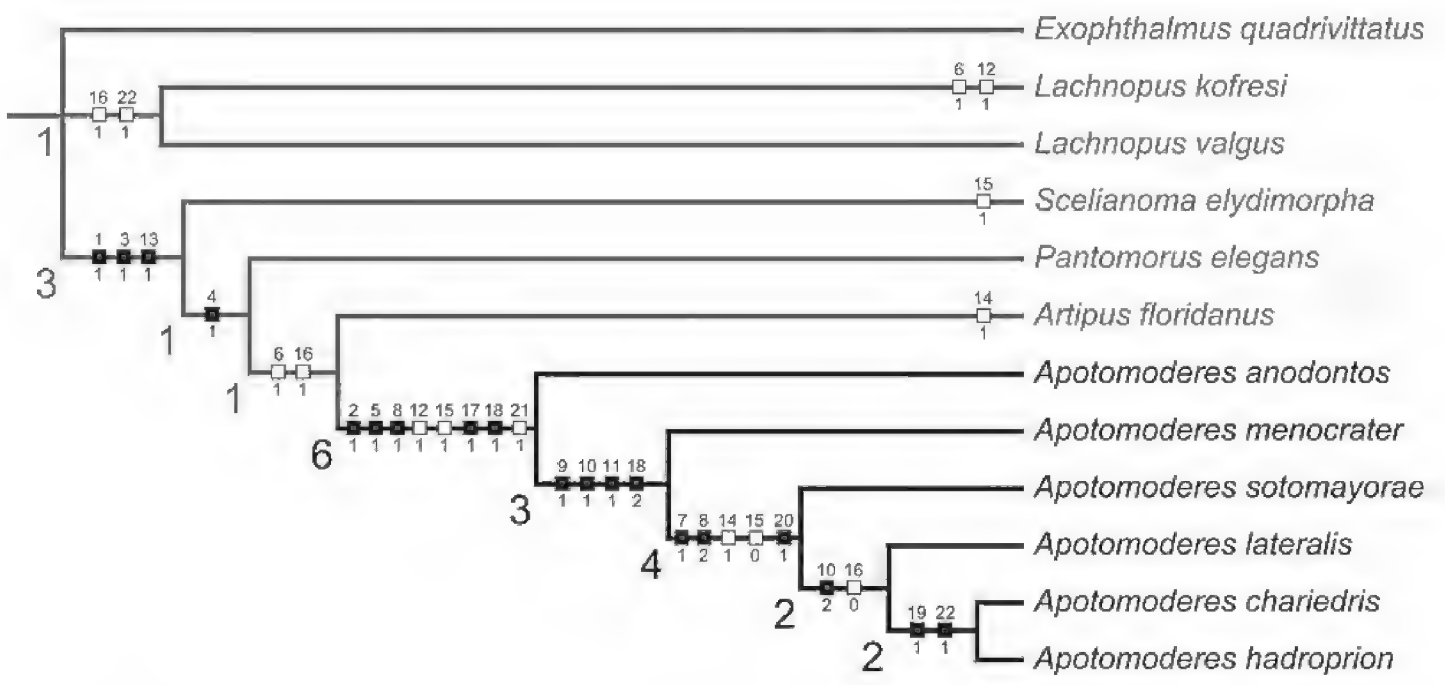

Figure 19. Phylogeny of the species of *Apotomoderes* and select outgroup taxa, according to the single most parsimonious cladogram (L=33, CI= 75, CI=90). Character 15 is mapped under ACCTRAN optimization, whereas character 16 is mapped under DELTRAN optimization. All other characters have unambiguous optimizations. Black rectangles represent single, non-homoplasious character state transformations, and white rectangles represent multiple, homoplasious character state transformations. The numbers above and below each rectangle correspond to character numbers and states, respectively; the numbers displayed at the left end of each branch represent Bremer support values.

herein presented phylogeny should not be interpreted as a strong hypothesis about the relationships among the outgroup taxa. In his recent review, Pérez-Gelabert (2008) lists more than 70 entimine species for Hispaniola; nevertheless the actual number of species may be twice as high based on the difficulty to identify dozens of species found on the island during a single field trip in 2008 (Charles W. O'Brien, personal communication). It is therefore likely that the closest relative to *Apotomoderes* remains undescribed. On the other hand, the outgroup selection is considered adequate for polarizing character states within *Apotomoderes* (Nixon and Carpenter 1993).

The distributions of *A. anodontos* and *A. menocrater* in the southwestern Dominican Republic on one side, and the *A. lateralis-A. hadroprion* clade in the eastern Dominican Republic on the other side (Fig. 18), are congruent with the geological separation of a (1) southern ("Tiburón") and (2) central (central + northern) peninsula constituting the paleoislands that make up Hispaniola (Iturralde-Vinent and MacPhee 1999). The two regions are separated by the Cul-de-sac Lake Enriquillo Valley (corresponding to the Muertos Trough), a very dry desert habitat that divides many components of the fauna of Hispaniola (e.g. Rosen 1985; Liebherr 1992; Liebherr and Godwin 2004). However, the age of origin of *Apotomoderes* is likely (much) younger than the Miocene collision of the southern and central/northern peninsulas (cf. Heubeck and Mann 1991). In particular, the *A. sotomayorae* / *A. lateralis-A. hadroprion* split (Fig. 20) suggests that all components of this clade are of late Miocene or early Pliocene origin (i.e. 5–7 mya), or possibly even younger, given that Mona Island rose above sea level at this stage (González et al. 1997). This would suggest that *Apotomoderes* originated and speciated some time in the Oligocene-Miocene on the southern Hispaniola peninsula, followed by two individual and unidirectional colonization events of the central/northern peninsula and of Mona Island, respectively. On the other hand, the presence of multiple, apparently sympatric species of *Apotomoderes* within each of the Hispaniolan areas of endemism cannot be explained with the scarce available information on habitat preferences and host plant associations.

Figure 20. Inferred taxon-area cladogram for *Apomotoderes,* with *Artipus floridanus* representing the outgroup area.

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